

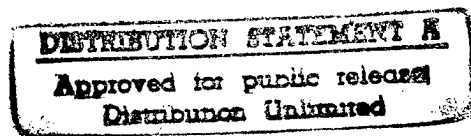
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17 December 1984

China Report

SCIENCE AND TECHNOLOGY



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CHINA REPORT
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FOREIGN BROADCAST INFORMATION SERVICE

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17 December 1984

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NATIONAL DEVELOPMENTS

REFORM OF NORTHEASTERN NORMAL UNIVERSITY ADVOCATED

Changchun DONGBEI SHIDA XUEBAO (ZHEXUE SHEHUI KEXUE BAN) [JOURNAL OF NORTH-EASTERN NORMAL UNIVERSITY (PHILOSOPHY AND SOCIAL SCIENCES ISSUE)] in Chinese No 4, 1984 pp 3-11

[Article by Fan Wanqing [2868 5502 3237]: "We Must Raise Scientific Research Work to a New Level; A Speech Delivered on 5 May to the National Convention for the Commendation of Advanced Research Collectives and Outstanding Research Achievements"]

[Text] Comrades:

The purpose of today's convention is to honor and reward advanced research collectives and outstanding achievement in research. By participating in this meeting, I have learned very much and recieved much inspiration.

From the collectives and achievements we have honored, it is apparent that in recent years our research work has achieved greater progress, substantial results and marked success. These achievements concretely illustrate that our ranks are growing, our knowledge is advancing, our vigor increasing and our ability to solve problems improving. Thus we have reason to entertain even greater hopes for the future.

In commending previous achievement, we hope to inspire even greater achievement; and in rewarding past contributions, we hope to encourage even greater contributions in the future. Thus we participants in this convention should not only take delight in the achievements of the past but should also carefully ponder how to make even greater achievement in the future. Achievement is important, but the experience derived through the attainment thereof is even more valuable. We should turn achievement into an inspirational force for further achievement, and, more importantly, we should extract valuable experience from achievement to create even greater achievement, transform experience into a guiding force to promote future practice and propel research work into a new stage of development and to an even higher level.

The achievements of and shortcomings in research work and the methods by which we can further advance this work have already been clearly and concretely described by Comrade Huang Qichang [7806 0796 2490]. Here I should like

only to focus on several problems of understanding so as to supplement what Huang Ruichang said: setting our aims high, improving the level of scientific research and encouraging outstanding talent.

I. Problems Relating to Setting Our Aims High

Institutions of higher education both are places in which cultural and scientific knowledge are imparted and form the front lines for the development of culture and science and thus must produce both scientific talent and scientific results. Teaching and research are the two, inseparable facets of this fundamental task and form the link between succession and development and between study and creativity. Teaching provides the foundation for research, and research is the precursor of teaching. Thus these two facets are interlinked and promote and complement each other. Ignoring improvement in the quality of teaching represents a deviation from the basic tasks of schools, and if scientific research does not progress, teaching quality cannot be improved. The teaching quality of a school is directly related to the technological level of that institution. For if that level is low, teaching quality inevitably will be poor, and teaching quality can only be good if that level is high. If we are to produce good students, we must have good teachers. For without good teachers, good students are hard to produce; good teacher can produce good students, poor teachers harm such students. Thus each teacher must simultaneously fulfill his pedagogical task very conscientiously, participate energetically in research work and thus strive to be an educator adept at both research and instruction.

In recent years, research work at our school has achieved better progress and continues to advance, people's understanding of research work has risen and continues gradually to improve, enthusiasm for research in the science of human affairs has increased and continues to grow, and our ability to carry out research has improved and continues to do so. These are major trends in the progress of our school's research work.

Nevertheless, it is readily apparent in practice that differences exist in people's understanding of, enthusiasm for and rate of progress in research work.

There are many reasons for this variance: different subjective factors; various objective factors; problems in understanding, enthusiasm and prerequisite conditions; and concrete difficulties.

We must admit that conditions in our school are relatively poor. There are many, many difficulties in terms of physical plant and equipment, and many comrades lack the necessary working and living conditions. This is an objective fact and a problem that the school is determined vigorously and steadily to resolve. Material factors have an important effect on whether or not a school can improve rapidly. For if material conditions are poor, equipment and instruments insufficient and the necessary living and working conditions lacking, instructional quality inevitably will be affected and research activities will be limited. Anyone who refutes this point also denies objective fact and thus is not a materialist.

Nevertheless, we must also recognize that material conditions are not the only factor that determines the rate of improvement in teachers. In fact, the policies, measures and methods of the leadership and the thinking, disposition and spirit of each individual all are factors that play important roles. Different levels of determination, resolution and spirit will produce different results.

Why is it that, even among teachers working in equally good schools, some of those people improve fast while others improve slowly? Why is it that, in poor schools, some teachers enjoy great success while others achieve little? And why is it that, under good environmental conditions, some teacher accomplish little, while other teachers, under poor conditions, show great accomplishment? The reason is very simple: material and spiritual factors cannot replace each other. Spiritual conditions are positive and active, while material conditions do not exert any effect on their own and must work instead through spiritual factors. Although conditioned by material factors, spiritual factors, on the other hand are by no means passive but rather are dynamic. Thus in certain cases, people with good attitudes who work under poor material conditions can outperform people who enjoy excellent material conditions but lack spirit. If we have sufficient spirit and show great diligence, we will be like a tiger that has grown wings when our material conditions are improved. But if we lack spirit and diligence, such improvements will mean nothing beyond themselves.

History proves that, both in China and abroad, the people who have made great achievements in science have not always enjoyed excellent material conditions, and people who are so favored do not always show outstanding accomplishment. Thus outstanding scientific achievement and excellent material conditions are not always identical. However, such achievement is inseparably related to superior spiritual conditions, in which people courageously overcome difficulties.

Evidence for these facts can be found in each department of our school. People who work at the Northeastern Normal University share similar objective conditions but show markedly different rates of improvement. Some teachers improve fast, others slowly. Indeed, there are even differences among comrades who graduated during the same period and who work under similar environmental conditions. Although there is diversity among teachers' individual qualities are other factors, in most cases the difference in improvement is due primarily to variation in mental attitude, enthusiasm and diligence. If a person does not have lofty aspirations, he will not exhibit tenacious enthusiasm and diligence and will not create and achieve very much. Achievers possess determination, drive and resolution, that is to say, they display the commendable, indomitable spirit of devotion to the four modernizations. Spirit and determination are interrelated, and achievement and effort are inseparable. Great accomplishment will not suddenly descend upon people who lack determination and spirit.

The comrades we honor at this convention have shown rapid and great progress, and we can discern in them a common characteristics, which is that they all have determination, spirit and resolution. It is not that they do not

confront difficulty but rather that they are not deterred by it. And it is not that they enjoy superior material conditions but rather that they possess better mental attitudes. Thus instead of submitting to difficulty, these comrades conquered it through a spirit that is governed by lofty aspirations. Spirit is the external manifestation of a person's mental attitude, and aspiration is what motivates people in action. When a person has this type of motivation, he then possesses a spirit that can overcome difficulty, surmount material limitations and create achievement that surpasses anything the average person can imagine. This is a tangible thing and people should recognize it. We must summarize, publicize and study the experience of these comrades so that even more people will come to possess this spirit and zeal.

Undeniably, we must, of course, also devote effort to obtaining funds from every quarter, expand our financial resources and strive to improve the material conditions in our school. School leadership still must do much more work to improve management of human, financial and material resources; tap potential; provide good logistics; and improve our working and living conditions. We still have not completely fulfilled our responsibility and thus must strive to improve our work. There is no need for doubt on this score. Yet improvement in material conditions can only be relative, will never achieve perfection and is an infinite process. If we compare yesterday and today, we will note that such improvement has been achieved. But compared to tomorrow, there is still a gap, for tomorrow's conditions will improve upon today's, and conditions on the day after tomorrow will even be better, and thus the gap appears still greater. In fact, science is progressing, technology is undergoing renewal and thus material conditions inevitably will also experience constant change. Things that are advanced today will become outmoded tomorrow, and things that are advanced tomorrow will become outmoded the day after tomorrow. Nothing is ever static, and conditions will never be perfect.

Thus we cannot wait until material conditions are improved tomorrow before joining the struggle. Rather, we must make full use of today's conditions and strive to overfulfill today's tasks and to create the best conditions possible so as to ensure even greater achievement tomorrow.

Practice proves that people usually cannot reap before they sow but generally have to sow before they can reap. This, which amounts to enduring the bitter before enjoying the sweet, is almost axiomatic.

Schools must have better material conditions in order to improve rapidly. But these conditions can be obtained only by overcoming difficulty and through diligence and outstanding achievement.

Thus we must all set our sights high and work hard and solidly. Though material conditions might be poor, our spiritual conditions must not lag. We must adopt a firm mental attitude to overcome and remedy material insufficiency and use greater achievement to obtain better conditions.

Our school is a multileveled normal university. We must continue to expand the school, but even more importantly, we must strive to improve it. We must

both steadily improve the quality of instruction in each of our existing departments and attempt to attract more and more master's and doctoral students in specialized disciplines. We do not at present have any experts that are qualified to sit on the Scientific Council, but we cannot be satisfied with this state of affairs for long. The school bears the responsibility of helping comrades near or achieve this standard, and our more qualified comrades should strive for even higher standards so that we can place some people as candidates for future vacancies on the council.

II. Problems Relating to Improving Scientific Research

Research work is beginning to receive widespread emphasis throughout our school, and the number of people now participating and the size of the results achieved in such work is unprecedented. Whenever the masses voluntarily become active in a cause, that undertaking acquires vitality for further development, impetus to progress and hope for new breakthroughs.

It is worth noting, however, that although our research results have increased greatly, quality has not advanced so fast, levels have not risen as much and breakthroughs have not been as large. This is an important problem of which we must be aware.

There are specific reasons why the quality of research is insufficient, but in general that quality concretely reflects the level of our current strength. If we are strong, research results can be improved, but if we are weak we shall never be able to improve no matter how hard we try. This is something that subjective human desire cannot change. The capability of some comrades, especially young ones, is limited because of weak foundations, and thus at present these comrades naturally find it difficult to produce quality research results. We should require that these comrades start low and work up, because such a progression accords with the developmental law of research work. If these comrades instead are allowed to set their sights too high, they will be unable to produce quality results and will even find it difficult to achieve simpler results. One can never achieve the speed he desires and will find that haste makes waste if he exceeds his practical capabilities and insists on condensing three or two steps into one. Thus we should not spurn low-quality research and slight increase in quantity. Rather, we should encourage all levels of research work.

Nevertheless, while increasing quantity, we should also call everyone's attention to raising the level of research and improving the quality of research results. At a teacher and staff meeting last year, Dean Hao Shui [6787 3055] correctly and explicitly noted this problem. We should remind everyone once again to place emphasis on the matter.

Some comrades possess better foundations and substantial levels of expertise and are qualified to make further advances. If such comrades are a little more determined, set their sights a little higher, think a little more and make greater efforts, they can move up to the next level and produce better research results. But some of these comrades are content with the present situation, are satisfied with numbers, seek only quantitative growth and do

not stress improvement in quality. Some people believe that success is achieved through numbers, and we lack the concept of using quality to overcome quantity. In fact, quantity is merely a matter of a greater or smaller number and does not imply a higher or lower level. The accumulation and increase in quantity does facilitate improvement in quality but cannot be equated with or replace quality. No matter how much the quantity of low-quality results increases, the level achieved is still low. And no matter how few quality results are produced, a high level has still been achieved. When we measure a person's value, we must look at his contribution to society. And when we measure the value of a research result, we must consider its function in the development of social practice and theory.

Practice is a standard by which to test both truth and the value of research results. Ten monographs that have insipid contents, make no contribution and produce few social results will never leave any impression and probably will not even be read very much. But an article that exerts a large and positive effect on social practice may long be remembered and might even make the history books. This illustrates that the level of research is not calculated in terms of multiples of quantity but rather is measured in terms of qualitative value. This is the reason people often say they would willingly sacrifice a little quantity for a bit more quality.

We are by no means advocating single-shot sensationalism in research work, but we also do not place any store in ineffective shotgun approaches. What we favor, rather, is letting small projects be small and large ones large so that everyone contributes as best he can, and the greater the accomplishment, the better.

In comparing which approach is best, we must ultimately look at results. The quality of these results depends on their practical and theoretical significance, which is often inseparable from the direction research topics take. Thus, to raise the level of research work, we must properly select our main direction of attack. In view of conditions in our school, it appears that we should be attentive to the following problems.

First, we must resolutely orient ourselves toward modernization, the world and the future. The liberal arts should strengthen study of practical problems, and the sciences should improve research in the actual problems involved in production. Understanding of the objective world follows advances in practice and steadily progresses through continuous resolution and generation of contradictions between knowledge and practice. Research projects that yield great social results frequently emerge from practice, and quality research results usually possess profound practical significance. New theory and new science emerge and develop through the practice of resolving real problems. It will be hard to achieve progress in theory if we become divorced from reality and practice. Integrating practice with scientific research will directly contribute to the "four modernizations" and make possible application of and advance in theory. New applications of old technology can sometimes be found, and new technology can occasionally be discovered through application of old technology. Research topics that are raised in practice are frequently urgent and possess conditions that are ripe for

resolving problems. Thus, although integrating practice and scientific research involves hard work, that work does yield sweet rewards. Whoever confronts reality, advances in big strides and devotes great effort will obtain results and sweet rewards. And whoever persists in this endeavor for a long time will reap the greatest rewards.

Second, we must strengthen research in basic science. Such research must begin with the basics, but we must not dwell on these for 10 or 20 years or linger on the peripheries for several decades. Rather, we must make contact with modern literature and the newest achievements as quickly as possible and boldly plumb the depths and scale the heights. To progressively reach new realms in each discipline, we must strive steadily to achieve new levels of development in each speciality. Whoever reaches the forward position in modernization will gain the initiative and take the lead.

Third, while strengthening research in each discipline, we must also be attentive to exploratory work in developing disciplines. Especially important is the fact that, due to the rapid development of science and technology, disciplines have begun to affect each other, science is becoming both more macroscopic and microscopic and peripheral disciplines continuously emerge. Thus we must promptly strengthen cooperation among disciplines and initiate interdisciplinary research. Coordination among basic theoretical research topics must be strengthened, and these topics must be closely integrated with the practical problems of production. For cooperation facilitates breakthroughs in problems and progress in each discipline.

Fourth, we must strengthen study of the problems involved in instructional reform. At present, our educational and instructional work do not meet the needs of the times and of developing circumstances. If we wish to keep pace with development, we must conscientiously implement reform.

Reform is a major affair that should be stressed by each level of leadership and all teachers and staff members in the school. Instructional reform, especially, should be a matter of common concern among and a subject of joint study by all teachers.

With the steady advance of science and technology, the elimination rate for knowledge is very high, the aging cycle for knowledge is becoming increasingly shorter and the renewal of knowledge is accelerating. Thus making instructional content keep pace with progress in science and technology, eliminating outmoded components in a timely fashion and appropriately incorporating modern scientific knowledge have become a crucial problem. For the things students learn in the classroom are outmoded when those students leave school. The things taught in school date back to the 1960s, the 1950s and before, but the 1990s will be at hand when the present students graduate and go to work. Thus instructional content does not meet the needs of the four modernizations very well. For example, students in the natural sciences do not have much contact with such important and new scientific technology as computers, and thus upon graduation these students are "scientific illiterates" and have a hard time keeping up with the needs of developing circumstances.

Throughout the school, each course differs in terms of the quality of instruction provided, and actual conditions vary. But a common problem is that there are too many classes, the curriculum is overly variegated and course content is outmoded. Thus we must streamline and renovate our course loads. This is a problem that affects our ability to train students who can meet higher standards, work independently and display creativity.

If classes are too numerous and varied and course content is outmoded, learning will become a matter of piling up knowledge, the time devoted to general study cannot be reduced, instruction will be reduced to spoonfeeding and students will be overburdened, unable to digest course material and incapable of independent study. Thus we must set our resolve to reduce class hours and streamline instructional content so as to increase the amount of time students can devote to self-study and strengthen students' capacity for independent work. Selecting instructional content is not something a single expert can undertake by himself but can only be achieved step by step through the mutual concern of and vigorous study by all teachers and through organized and properly directed reform experiments.

Reform of instructional content should emphasize less quantity and better quality and stress development of students' capacities for independent work and creativity.

Reform frequently encounters resistance and difficulty and thus requires a high degree of dedication, a pioneering spirit that dares to blaze new trails and support from all quarters. A major innovation that has been employed in factories is the use of incentive rewards. Pedagogical reform faces even greater difficulties, takes longer to yield results, is often of greater significance than technological reform and thus requires even greater inducements. We hope that each teacher will show interest in reform, contribute ideas concerning the reform of the school and each department and, more importantly, propose plans for reforming each specialty and course. All important ideas for the development of the school and each department that proves effective through practice or plans for the reform of course instruction that proves successful through experimentation should be treated as research results and be given commendation and reward according to the objective effect engendered thereby. Prior to the Cultural Revolution, there was the Guo Xingfu [6753 5281 4395] pedagogical method. If a significant and very effective reform emerges from our school, we might consider naming that reform after its creator so as to provide major contributors with spiritual rewards.

Research work is exploratory and pioneering in nature, vast in scope and varied in topic. There should not be any fixed demands regarding how we should approach a problem or what direction we should take thereto, and each topic should employ different choices and methods. But practice tells us that speed and direction are closely related and quality and results are intimately interconnected. If direction is correct, then there may be speed; if results are great, then quality might also improve. Thus we should be attentive to the direction that research topics take and emphasize social results. We should seek speed through the correction of direction and good quality through the increase in social benefits.

In view of the correct conditions in our school, we should further orient ourselves toward modernization, the world and the future and, following this general direction, we should steadily strengthen research in practical problems and the actual problems involved in production, increase contact with basic theory and new realms, enhance exploration in peripheral disciplines and improve our study of problems associated with instructional reform. At present, these topics represent the weak link in our research work, but in the long term they should form the main direction of our key advances. Breakthroughs are difficult to achieve, but without them, we would face even greater difficulty and would find it hard to create new prospects, achieve new levels and keep pace with developing circumstances.

The advance toward science in a certain sense is a march toward difficulty. But in this world no victory is permanent, and no difficulty is forever insurmountable. Each scientific fruit can only be obtained in exchange for hard work, and each success must be achieved by overcoming difficulty. In research work, whoever lacks long-range objectives and seeks only immediate profit, whoever fears difficulty and takes the easy way out and whoever races about and wastes his time in idle chitchat has no hope of obtaining quality research results and of reaching the pinnacle of scientific success. Only those researchers who brave difficulty, hard work and hardship; keep plugging away; and arrive to scale the highest mountains can ever hope to feel the summit beneath their feet.

III. Problems Relating to the Encouragement of Outstanding Talent

People are bound to differ in their pace and position during the march toward science, and these differences will change continuously. Positions are not fixed, and patterns are not eternal. For science and talent are undergoing renewal, and top-notch individuals continuously emerge. At certain stages, such people become the leaders in the march toward science.

Scientific leaders emerge in the wake of progress in scientific work and continuously grow and improve while promoting that work. Such people are not appointed nor can they be elevated by anybody. Truly outstanding talent cannot be denied or repressed, and imposters can never be established or promoted. Pulling young sprouts to stimulate growth only serves to hasten their demise.

Nevertheless, the growth of outstanding talent is not an entirely natural development and requires excellent training work, and the better that works, the faster growth will be. Thus our common responsibility includes avoiding both repressing and pulling young sprouts and involves careful nurture and support of young sprouts. Leadership must be adept at discovering talent, be bold in fostering such talent and adopt policies and methods to facilitate development of such talent so that it matures faster and can better play its exemplary role. When we look back at the history of our school, we note that "leftist" thought, which was influential for a long time, repressed, attacked and severely affected the growth of talent. We should never forget this lesson.

One does not easily acquire outstanding talent, and people who do so are, by definition, a minority and can never be the majority. Thus such people are frequently singled out for scrutiny by the majority of the population, and their problems are often viewed from different angles. Consequently, the development of outstanding talent naturally is subject to widespread concern and supervision and frequently encounters resistance. Such talent, therefore, especially needs protection.

Where does resistance come from? In addition to stemming from the pernicious effects of "leftism," resistance also frequently comes from egalitarian thought, a major feature of which is the notion that what you have, I must have; what you get, I must get; when someone does not obtain something, then no one should get it; and when someone does not have something, then no one should possess it. Egalitarians stress that work assignments should all be the same, opportunities for further study should be equal, promotions and raises should be similar and living conditions should be equivalent. This is what people call "eating out of the same big pot," for the "big pot" is a product of egalitarianism and a concrete manifestation of egalitarian policy. The "big pot" makes special allowances for sluggards who do not work very much or not at all but hampers those stalwarts who work hard and do more. Egalitarian policy encourages people to be dependent on others, look for handouts and make more demands. On the other hand, the socialist policy of differentiated treatment encourages people to compete, take the initiative and contribute. These two policies produce different results. Egalitarianism inhibits expansion of productivity and improvement in the level of science. Differentiated treatment promotes expansion of productivity and improvement in the level of science.

Assisting and encouraging the outstanding minority comprise an important socialist policy. Such a policy might appear to be focused on only a few people, but its essence lies in arousing the majority to compete, take the initiative and make contributions. During our march toward science, we must not be like students running in ranks--yelling out orders, marking time, counting off, keeping in step and moving slowly--unison can only be slow, never fast. Instead, we must be like a footrace. When the gun goes off, everyone explodes from the blocks, vies for the lead and fights to keep up. Only in this way can we let out good achievements, produce record-breaking talent and win glory, honor and benefit for the collectivity.

Superficially, it might seem that, since outstanding talent is in the minority, only a few people would benefit from such a policy. But, in fact, the policy benefits the entire enterprise, the school and each member of the group. The more outstanding talent a school has, the more the school--including each member thereof--benefits. Thus, just as he would cheer on athletes at track meets, each person at our school should support the development of outstanding talent and help that talent surge forward.

Leadership at all levels must continue to extirpate the pernicious influence of "leftism," eliminate egalitarian thought, implement a policy of rewarding outstanding talent, adopt resolute measures and selectively foster top-notch talent. What is courage? When one comes to understand what must be done in

his work and, even though people might oppose him, he wins them over and perseveres--that is courage. A clear proposal for the training and improvement of teachers has been provided in the school's administrative work plan and is fully supported by the party committee. This semester, the party committee will try to discover the best teachers in each department and, like the administration, is prepared to adopt measures to accelerate the development of leaders in each discipline. We must progressively seek concrete measures by which to reassure outstanding talent and enable such people to work enthusiastically; to satisfy the majority of our comrades who are diligent and give these people leeway in their work; and to increase the pressure on the minority that lacks drive, intensity and diligence and force these people to realize they cannot continue doing things in the old way. The appearance of such an atmosphere will indicate that our policy is correct. Conversely, if the people who lack drive and intensity remain satisfied and if outstanding talent is stifled, that would suggest that there are problems in our approach and that we must make adjustments to facilitate the development of outstanding talent.

In the work of selecting and training, outstanding talent, we must have foresight, observe developments, emphasize middle-aged and young people and be especially attentive to the training and improvement of young teachers. At present, young teachers do not play decisive roles, but they will exert a decisive effect on the future development of the school. Old and middle-aged teachers still guide younger ones, and this is natural. And in the future, young teachers will replace old and middle-aged one, for this is inevitable. A true scientist should strive to surpass his predecessors and seek to create the conditions by which to enable his successors to surpass himself. One should expect to improve upon his predecessors and welcome further improvements by his successors. Jealousy of successors' improvements indicates a lack of understanding of the dialectics and developmental laws of history.

The famous educator Tao Xingzhi once stated, "The most gratifying thing for a teacher is to produce students that he himself can respect." I believe that each level of our leadership should take delight in selecting and training talent worthy of respect. The old adage says that one would do better to find a Bole than to obtain a fine steed. This means that we not only need a Bole to help us acquire a good horse, we also need people to help us find a Bole. In a certain sense, it is even harder to be a Bole, for such a role requires that one have vision, courage and wisdom; not be afraid of opposition or of making mistakes; and possess a great sense of responsibility.

We are about to commence selection of graduates for retainment. This work involves selecting talent and building the teaching staff and must be accorded the utmost attention by the party and administrative leadership at all levels. Leaders must take the initiative in this work, conduct interviews themselves and acquaint themselves with the situation. There must be no bureaucratism, for bureaucratism, should it crop up, would indicate that leaders lack devotion in their departments. And back-door activities, if permitted, and acceptance of unqualified personnel would constitute serious neglect of duty. In selecting graduates, we must adhere to the principle that candidates

should be both red and expert, and we must place emphasis on candidates' abilities to think and work independently and innovate. We must rank candidates according to their grade averages, but we should not consider grades alone. Instead, we should stress candidates' potential and prospects for development. So long as each department follows this method and continues to do so for many years, we can expect new changes in our teaching staff, especially among young teachers.

We must employ all sorts of channels to discover talent, all types of methods to train that talent and all kinds of ways to encourage outstanding talent. This approach will produce different tendencies in the outstanding talent that is accorded special recognition. Some people will feel a greater sense of responsibility and thus make greater demands of themselves, put forth greater effort and make bigger achievements. But some people may come to overestimate themselves, look down on others, become divorced from the masses in their lofty positions and grow arrogant and complacent in their fields. If this occurs, we are obligated to guide these people and give them careful thought reform so as to help them readjust the relationships between the individual, the group and the collective and convince them to make greater demands of themselves politically, ideologically, professionally and in their work. We should point out to such comrades that arrogance is a manifestation of ignorance and complacency is a reflection of a lack of skill. If people are not humble, they will not progress, and complacency will cause people to come to a standstill.

Nevertheless, we should criticize only the things that are bad, not those that are good. We must not treat as arrogant and complacent those people who are adept at thinking independently, are willing to stand by their views, boldly oppose deviations and dare to criticize shortcomings in leadership. Nor should we so treat the confidence and unremitting efforts such people display and devote to their struggle to master their fields. More importantly, we must by no means exaggerate the shortcomings such people are bound to have, single out one defect to misrepresent the whole picture and focus attack on one minor problem to the detriment of all else. This erroneous "leftist" proclivity, which plagued us in the past, restricted development in scientific results and slowed out school's advance. We must never forget this lesson. To improve our school, we must correct our ideological line, adopt effective measures and painstakingly and vigorously train and support talent. In the case of young comrades, especially, we must proceed from reality and treat their strengths and shortcomings strictly, practically and correctly. We should not be afraid to employ competent young people just because they show a few minor defects. Instead, we should give these people more education and assistance during their employment. We should not sit back and wait until they overcome their problems before we go and train them. Rather, we should help them consciously to overcome their shortcomings during training. Of course, if we should discover that a young comrade has serious problems and refuses to accept criticism and reeducation, we should not continue to accord him selective status and attempt to retrain him. For what we are trying to develop are scientists with healthy attitudes and upright characters and who can be both red and expert, not greedy, overweening egotists. In training work, only by persevering in the right direction and

direction and along the correct path can we enable outstanding talent to develop in a healthy manner and take its proper leadership role.

Comrades! Today I have emphasized the problems of aiming high, improving the level of scientific research and encouraging outstanding talent. My main hope is that everyone will follow the path shown to us by the party, unite and work together to propel our school's scientific research to a new stage of development and a higher level and to contribute to the revival of China and the Northeastern Normal University.

12431

CSO: 4008/404

APPLIED SCIENCES

PRC TO MASS-PRODUCE 16-BIT MICROCOMPUTERS

OW131235 Beijing XINHUA Domestic Service in Chinese 1202 GMT 12 Nov 84

[By reporter Gu Honghong]

[Text] Beijing, 12 November (XINHUA)--This reporter has learned from the department concerned that the Ministry of Electronics Industry has selected the Changcheng 0520A microcomputer, developed in China, as China's first finalized quasi 16-bit microcomputer, and production of it in batches has begun. This is an indication that China's microcomputer industry has attained a new level.

It has been only 8 years since China began to use and produce microcomputers. In recent years, most of the microcomputers on sale in China have been imported products, or products assembled using imported parts. In order to improve this situation, China's computer workers have actively developed microcomputers suited to our realities while striving to learn foreign advanced electronic technology. The Changcheng 0520A microcomputer is an outstanding one among the products developed. According to appraisals, it has attained the world's technological level of the 1980s.

The Changcheng 0520A microcomputer is simple, light, and easy to use. It can easily operate new software, and is compatible with the most advanced 16-bit computers of foreign countries. It has software for processing a large number of Chinese characters, with seven advanced encoding systems for input of Chinese characters.

The Changcheng 0520A microcomputers are manufactured by the Beijing telecommunications equipment plant. The China Computer Technology Service Company and its more than 30 branches provide technical service to customers.

CSO: 4008/123

COMPUTER SOFTWARE MARKET OPENED IN BEIJING

OW300021 Beijing XINHUA Domestic Service in Chinese 0017 GMT 29 Oct 84

[By reporter Gu Honghong]

[Text] Beijing, 29 Oct (XINHUA)--China's first computer software market was opened in October in Beijing's Zhongguan Village, a place where most scientific research units are located. This market distributes and sells publicly to users the results of software research achieved in the last 3 years by the largest software development organization of our country--the 0500 Series Software Center.

Computer software, also known as soft equipment, is a collective term for all computer control programs. On identical hardware, the scope of a computer's function and application is determined by the quality of its software.

While computer use is very convenient, developing the software and designing the program is a complicated and arduous mental task. The design of a program often requires the efforts of several specialists working day and night for months. In the past, however, software received no due attention in our country, although it is the product of much mental work. It was not regarded as a commodity, and there was no market for selling it. In assessing the development of computers, attention was most often given to the quantity of hardware, while no consideration was given to the quality of software. This seriously hampered software development work and the wide application of computers in our country.

This software market distributes from 70 to 80 different kinds of software products, including those of the single-plate series, auxiliary products for software systems, and 0500 Software programs and data. In addition to selling already-developed software products, the software center operating this market also accepts orders for developing certain new software products.

CSO: 4008/93

APPLIED SCIENCES

JAPANESE REPORT INTRODUCTION OF NEW HIGH-PERFORMANCE FIGHTER

Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese No 10,
Oct 84 p 22

[Text] According to the 1984 issue of THE WORLD'S MILITARY AIRCRAFT published by the Japanese AVIATION MAGAZINE, "China, relying on its own resources, is trial-producing the "Jianji-8", a large, all-weather, supersonic fighter aircraft. It is a delta-wing aircraft whose airframe is larger than the "Jian-7" (MiG-21). Significant data on the Jian-8 are:

Wingspan: appx. 10 meters;
Length overall: appx. 19 meters;
Height: appx. 5.2 meters;
Weight: appx. 12 tons;
Power plant: two WP-7 turbojets;
Maximum speed: Mach 2.3;
Range: 1,300 to 2,040 kilometers.

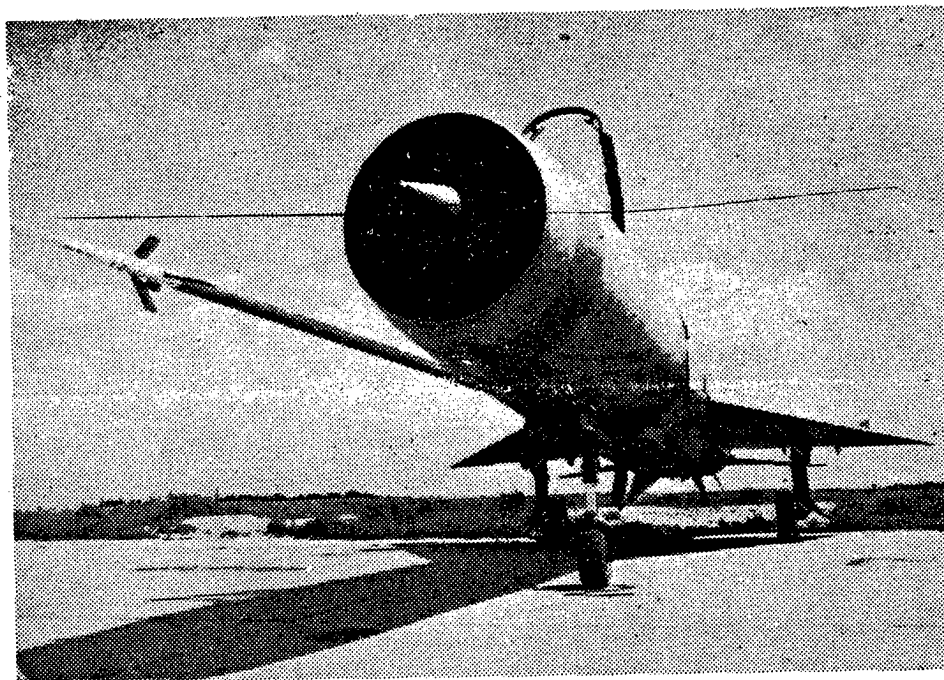
The aircraft is equipped with advanced radar and fire control systems."

CSO: 4008/97

HIGH-PERFORMANCE AIRCRAFT ENTERS BATCH PRODUCTION

Good Maneuverability, Combat Radius Cited

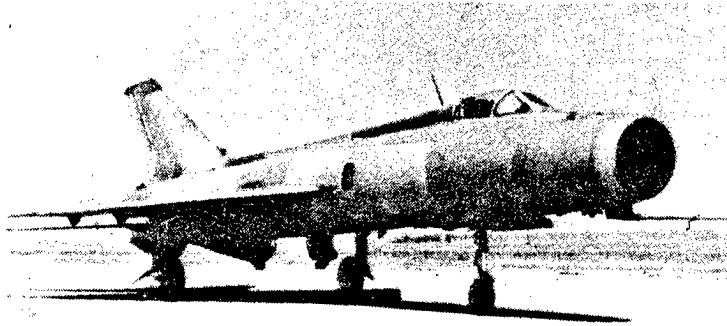
Beijing RENMIN RIBAO in Chinese 31 Aug 84 p 1



[Text] Shown is a new type of high-altitude, high-speed Chinese-designed fighter aircraft. It is equipped with two turbojet power plants, has excellent maneuverability, better range and combat radius, and can carry out a variety of combat missions.

All Chinese Designed and Developed

Hangzhou ZHEJIANG RIBAO in Chinese 2 Sep 84 p 3



[Text] A new type of high-altitude, high-speed fighter aircraft--all Chinese designed and developed--has gone into batch production. Equipped with two WP turbojet engines, it has excellent maneuverability, good range and combat radius, and can perform multiple combat missions.

CSO: 4008/19

NEW FIGHTER AIRCRAFT REPORTED

Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese No 10, Oct 84, p 22

[Text] On 9 June 1980, the U.S. AVIATION WEEK [AND SPACE TECHNOLOGY] published an article on the impressions of a U.S. aviation delegation following a visit to China. The article read: "The Chinese aircraft industry has designed a new type of delta-wing fighter called the 'F-8', but only a limited number have been produced. The U.S. industry figures were of the impression that the F-8 seemingly was a brand-new attempt by the Chinese aircraft industry to design a sophisticated fighter aircraft. Although it is not clear at this time how many F-8's have been produced, it is felt that the aircraft has existed for a period of time. The Chinese aircraft engineers and technical personnel, when responding to the Americans' questions, seemed to be saying that they were encountering problems in stability and control.

"The U.S. aerospace industry figures stated that the Chinese aircraft industry is doing its utmost to establish an overall management capability for model designs. Only with this capability will it be possible to develop new designs for both military and commercial aircraft. For several years, the Chinese aircraft industry has been pursuing a number of its own designs for new aircraft, including the advanced delta-wing F-8 fighter and the Y-10 four-engine jet transport, but the progress of this work has been exceedingly slow. This slow progress reflects the lack of experience on the part of the Chinese to organize large-scale design work.

"One of the Americans said, 'It is quite obvious that they don't have much experience when it comes to comprehensive analyses of complex systems, much less the compromise and balance in design that's required to develop an advanced aircraft. They've never had an opportunity to acquire the intellectual training to design a completely new aircraft.' 'Obviously, the Chinese are eager to master the management of advanced aircraft design and want to acquire detailed engineering assistance and training from the U.S.' Other Americans commented that the reason for the stumbling block in the way of increasing the capability for advanced designs by the Chinese aircraft industry is the lack of high-tech means such as computers."

On 6 October 1980, AVIATION WEEK reported the impressions of a U.S. Department of Defense delegation after a visit to China. The report read: "China is now installing equipment and facilities to produce the new F-8M2 delta-wing fighter

and is also enlarging its aerospace industry. The development of China's aerotechnology came as a big surprise to the Americans who had been given permission to tour various aircraft plants, engine plants, and research organs. The U.S. Defense Department delegation, headed by Under Secretary of Research and Engineering, William J. Perry, inspected a prototype of the F-8 at the Shenyang Aircraft Plant. The nose of the F-8 fighter/interceptor closely resembled that of the Soviet MiG-21. China is now copying the MiG-21, which it refers to as the F-7. The F-8 is fitted with a Chinese-made Tumansky R-11 turbojet power plant. The U.S. officials also remarked that the radar-guided air-to-air missiles for the F-8 and other new fighters were being developed in China."

On 26 and 27 July 1982, U.S. AEROSPACE NEWS reported: "The U.S. Defense Intelligence Agency presented the House Economics Committee an unclassified report [stating that] China was still experiencing problems in advanced technology. The design of the advanced fighter China is now developing and producing is but an example [of this]. Although the research and design on this project started back in the early 70's, the Chinese still have not been able to get this aircraft into quantity production. The principal reason for this could be that they have not been able to produce a suitable jet engine with which to power the aircraft."

AEROSPACE NEWS ran another article on 6 April 1984 reporting that certain U.S. officials responding to questions as to whether or not the appearance of the F-8 could destabilize the situation in the Strait of Taiwan, answered:

"This is a hypothetical question. The officials were of the view that it would be years before the F-8 could present a challenge."

"These U.S. Department of Defense officials held that the design of the F-8 seemed to be 'mismatched.' The M-2 delta-wing aircraft was larger than the F-7, borrowing technology from the MiG-23, but had only a single Chinese-made Tumansky R-11 power plant, making it obvious that thrust would be insufficient. The U.S. officials confirmed, and the July 1981 Defense Intelligence Agency report pointed out, that engines were the weak point of the design of the F-8 fighter. Only a few F-8 prototypes have been produced and it would be years before overall production could get under way 'without advanced U.S. technology.'"

It was also reported that "China's production of fighter aircraft occupied two-thirds of the production of all military aircraft. In the past few years, fighter production had declined, from 278 aircraft in 1979 to 125 aircraft in 1982. The figures for 1983 were still classified but were not estimated to have changed much. Even if the F-8 goes into production, the F-7 would remain China's mainstay fighter."

The publishing of this article in no way represents an endorsement of the writer's viewpoints or confirms foreign reports; it is done only to provide our readers with foreign materials on China's aviation developments.

CSO: 4008/97

F-7 SUPERSONIC DAY FIGHTER VIEWED

Beijing GUOJI HANGKONG [INTERNATIONAL AVIATION] in Chinese No 9, 5 Sep 84
pp 4-5

[Article by Liu Zhen [3966 4176]]

[Text] The Jian-7 is a single-seat supersonic jet fighter, and can be used in aerial combat, escort, air superiority, and ground support roles.

The chosen aerodynamic form of the Jian-7 aircraft is a delta wing with nose air intake. The wing's leading edge sweepback angle is 57° , and its anhedral is 2° . The airframe is mainly of aluminum alloy structure. The power plant is one WP-7A afterburning turbojet engine with afterburning thrust of 5,100 kilograms. The aircraft's high-altitude maximum speed is about mach 2.

The Jian-7 is a product that China delivered to units in the mid-1960's. During a long period of use, certain weak points in it were revealed, such as the time it could remain airborne was short, its close-combat firepower was insufficient, the adjustment of its air intake ducts was inefficient and its ejection seat system was complicated and insufficiently reliable. Therefore, our designers made many improvements on it. In recent years, the Jian-7 has been exported to Third World Countries. Some of the improvements made on the Jian-7 export model are as follows:

1. A 30mm cannon with 60 rounds has been fitted to the starboard fuselage to augment its close-combat firepower;
2. The original three-step adjustment of the air intake holes has been changed to a no-step automatic adjustment;
3. The power plant has been changed to one afterburning WP-7B engine, boosting the thrust by 1,000 kilograms;
4. An 800-liter auxiliary fuel tank has been attached to the mid-underside of the fuselage;
5. The landing brake parachute bay has been moved from the underside of the tail to the vertical tail root.

6. The belt-type ejection seat has been changed to an open-type ejection seat that is suitable for use at low altitudes and low speeds, and the pilot can leave the aircraft in an emergency at zero altitude and at 180 to 850 kilometers per hour.

The above-mentioned improvements have brought about good results. After the air intake duct was changed to the no-step adjustment type, its performance was improved. In addition, the engine thrust was increased, so that the aircraft's performance was correspondingly improved. With the thrust-weight ratio unchanged, the aircraft's operating altitude and speed have been increased. By adding a cannon, its close-combat firepower has been greatly augmented. In addition, the aircraft's operation is good and its external dimensions small, so that it is not easily discovered by enemy aircraft. At the same time, its defense is also quite good. These characteristics make the Jian-7 superior to aircraft of the same type.

The ordnance system of the Jian-7 includes an SM-3A optical cannon sight, which is joined with the range-finding radar and the angle of attack and side clip angle sensors. The armament on the aircraft includes a 30mm cannon on the starboard and port sides of the fuselage, and on the underwing attachment points a pair of R550 or PL-2 air-to-air missiles, or two 57mm rocket clusters, or two 50- to 250-kilogram aerial bombs. At overload times two 500-kilogram bombs are attached.

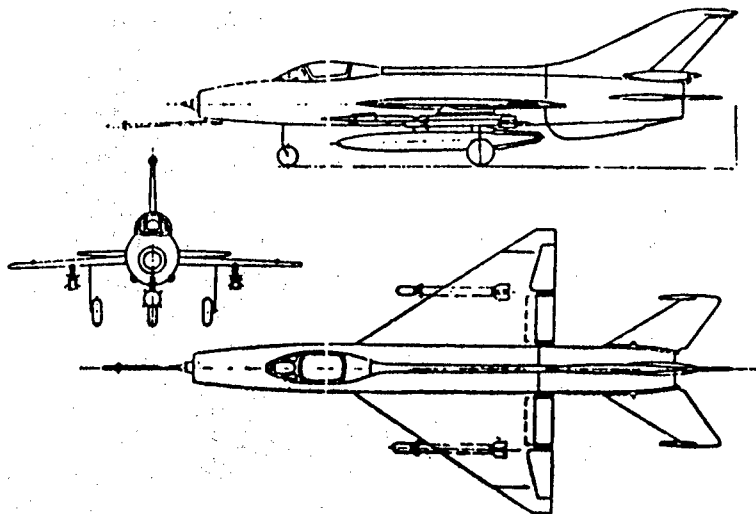


Figure 1.

The main technical and performance data of the export model Jian-7 after improvements are as follows:

Length	13.94 meters
Height	4.1 meters
Wing span	7.15 meters
Wing area	23 square meters
Normal takeoff weight (with two PL-2's)	5,145 kilograms

Maximum level speed (H=12,500 to 18,500 meters)	M=2.05
Service ceiling	18,800 meters
Maximum range (H=11,000 meters)	
With missiles only	1,200 kilometers
With missiles and auxiliary fuel tanks	1,490 kilometers
Takeoff speed	310 to 330 kilometers per hour
Takeoff run	800 to 1,000 meters
Landing speed	300 to 320 kilometers per hour
Maximum service overload (with only PL-2's)	7 g

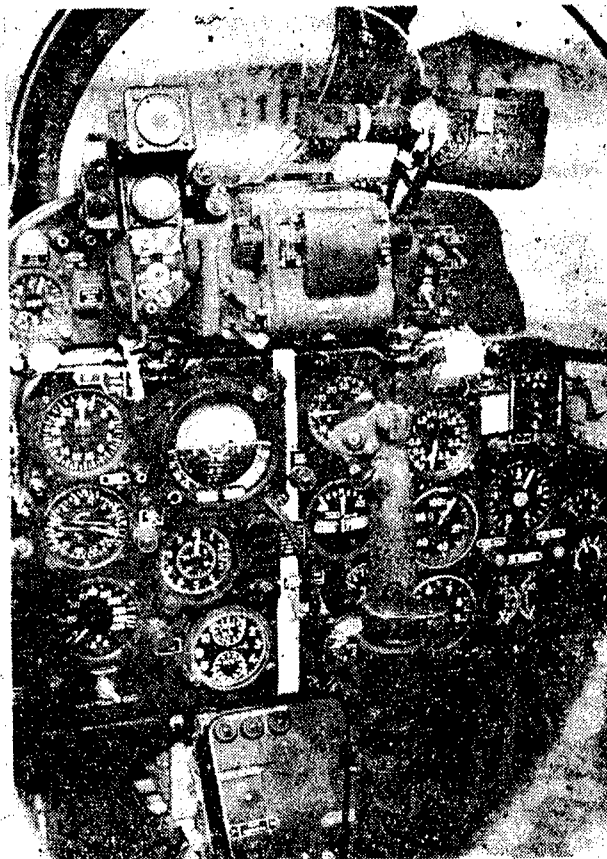


Figure 2.

To further improve the performance of the Jian-7 aircraft, we introduced from elsewhere some fairly advanced fire control electronic equipment, and added it to the Jian-7 as replacements or improvements of the original systems. The main items include:

1. A ground parallel line-of-sight indicator and a gunsight computer have replaced the original sighting device on the aircraft. The artificial horizon line-of-sight indicator can also display navigation data. Except for possessing the functions of inertial navigation and instrument landing, the

ground parallel line-of-sight indicator is of the same type as the U.S. F-16's indicator.

2. A range-finding radar that has a quick-change frequency function possesses better range-finding and antijamming capabilities, thereby extending the launch distance for missile attacks.
3. A new-type atmospheric data computer has been added to the aircraft.
4. A new-type radar altimeter has been added to the aircraft.
5. A two-wave band communications radio with a security device has replaced the original VHF radio.
6. Three static-type converters with 80 percent efficiency have replaced four rotary-type converters with fairly low efficiency in order to satisfy the requirements for power supply of the above-mentioned improved items.

All the above-mentioned refitted pieces of equipment possess fairly high reliability and good maintainability, and they all have self-check capability. On the first-line airfields, they can be changed for the other equipment without needing to be calibrated. The equipment's warmup time is not more than 2 minutes, and thus reduces the maintenance time needed for carrying out a second sortie. The time between breakdowns for the radar and the artificial horizon line-of-sight indicator is several hundred hours, and for the remaining equipment is more than 1,000 hours. The life of these pieces of equipment exceeds 10,000 hours.

Besides the above-mentioned improvements, there has been added under the wing two attachment points on each of which can be attached a pair of 480-liter auxiliary fuel tanks or a rocket cluster.

9727
CSO: 4008/9

A-5 SUPERSONIC ATTACK AIRCRAFT DESCRIBED

Beijing GUOJI HANGKONG [INTERNATIONAL AVIATION] in Chinese No 9, 5 Sep 84
pp 2-3

[Article by Ke Min [0460 2404]]

[Text] The Qiang-5 is a supersonic combat aircraft successfully developed by China, and it was designed and is produced by the Nanchang Aircraft Manufacturing Company. Research work on the Qiang-5 began at the end of the 1950's, and in 1960 the design work was basically completed and the trial-manufacture of a prototype began. At that time, China's national economy was in a 3-year period of difficulties. During a 4-year process of development, engineering personnel and workers surmounted numerous difficulties and, relying on their own hard work, completed the necessary experimental work for the development of the new aircraft, including high- and low-speed wind tunnel tests, ground simulation tests of all systems, and static and kinetic strength tests of the aircraft structure, so that the first prototype made its first test flight on 5 June 1965. At the end of the same year, the Qiang-5 was approved for batch production, following which a large number of them were allocated to units. In recent years, the Qiang-5 has been exported to Third World countries.

The primary mission of the Qiang-5 is the high-speed penetration of defenses at low or minimum altitudes to provide close air support to ground units. It can attack many kinds of ground targets, such as unit assembly points, missile launching sites, communications centers, airfields, shipping, and tank columns with bombs and rockets. It can conduct both level bombing and dive bombing attacks. Its cannons and rockets can be used in self-defensive aerial combat and the aircraft can also carry air-to-air missiles.

The layout of the aircraft features sweptback wings and lateral air intakes. The two lateral air intakes make space in the nose for electronic equipment. At that time, in comparison with the production MiG-type fighter nose intake it may be said that this was a bold and successful attempt by our design personnel.

In the wing's center monoplane, 25 percent of the chord line sweepback is 52.5° , the span-chord ratio is 3.37, and the root anhedral is 4° . The wing is a multispan box structure composed of strengthened covering, ribs and

spars, and on the inboard trailing edge are retractable flaps, with the outboard trailing edge having inner-suspended balanced ailerons. At the mid-point of each wing is a boundary layer lateral-flow fence to prevent the wing tip from advancing and loss of speed.

The fuselage is a conventional semimonocoque structure composed of strengthened covering, longitudinal spars, and long trusses, and is divided into forward and rear sections. The middle part of the fuselage is bee waist-shaped to meet the requirements of the law of transonic area. The important position near the cockpit in the forward fuselage is fitted with shell-proof armor.

The all-moving tailplane is on the top side of the tail part of the fuselage, and its total area is 8.62 square meters with a moveable area of 5 square meters. The total area of the vertical tail and rudder is 4.64 square meters.

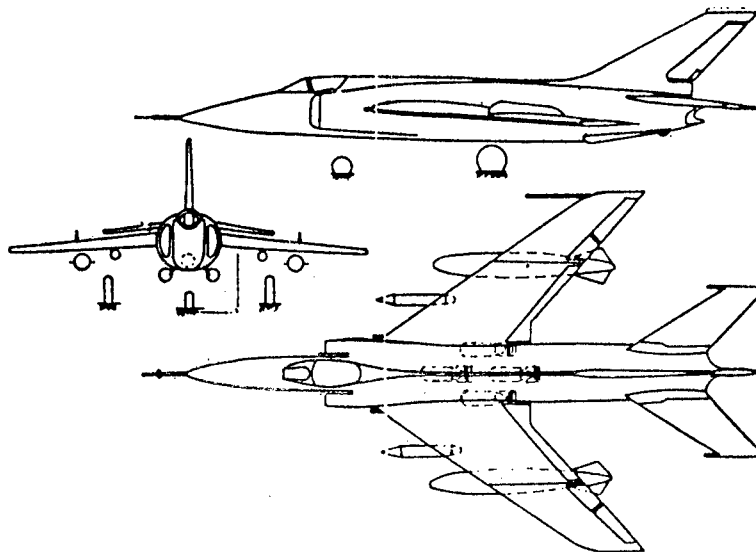


Figure 1.

The two WP-6 engines are housed side by side inside the rear fuselage, and each engine's maximum thrust is 2,600 kilograms, with an augmented thrust of 3,250 kilograms and an overhaul life of 200 hours. Inside the aircraft are 5 fuel tanks, 3 in the forward fuselage and 2 in the rear fuselage, with a total capacity of 3,730 liters. A 760-liter auxiliary tank can be attached to each underwing point. When a bomb is attached to the inboard point, a 400-liter auxiliary fuel tank can be attached to the outboard point.

The aircraft's landing gear are of the hydraulically retracted forward tri-cycle type. The forward and main landing gear are of the single-wheel type, with the forward wheel being retracted forward into the fuselage and the main wheels being retracted into the wing.

It has two hydraulic systems with a working pressure of 210 kilograms per square centimeter. The main system operates the retractable landing gear, wheel brakes, flaps, brakes, and afterburner jetpipes; the auxiliary system drives the ailerons and the boosters on the all-moving tailplane. The rudder is mechanically operated, and the adjustment shims of the ailerons and rudder are electrically driven.

The Qiang-5 has eight external attachment points, four under the wing and four under the fuselage. Its normal bombload is 1,000 kilograms, with a maximum of 2,000 kilograms. On each point under the fuselage, a 250- to 340-kilogram bomb or cluster can be attached. On each inboard wing point a 57- or 90-mm rocket pod, or a 250-kilogram bomb can be attached. An air-to-air missile can be attached to each outboard point. A 23-mm cannon with 100 rounds is mounted in each wing root. For level and dive bombing or launching rockets, an SH-1J optical sighting device is used.

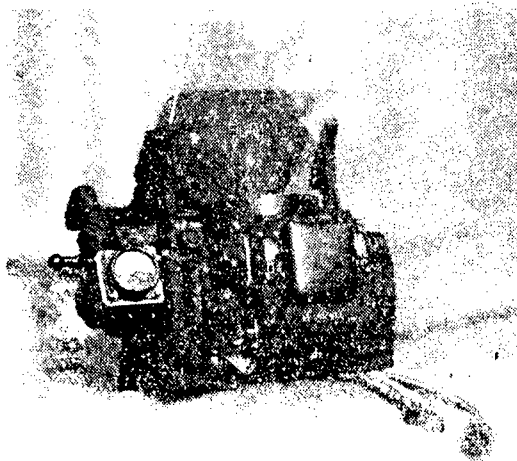


Figure 2. The Qiang-5's SH-1J Bombsight.

The Qiang-5 has a Chinese-developed rocket ejection seat which insures safe ejection of the pilot from the aircraft at zero altitude and at 250 to 850 kilometers per hour.

The principal tactical and technical data for the Qiang-5 are as follows:

Length (including pitot boom)	16.73 meters
Wing span	9.7 meters
Height	4.51 meters
Wing area	27.95 square meters
Service weight empty	6,494 kilograms
Takeoff weight (without external load)	9,530 kilograms
(with full external load)	12,000 kilograms
Maximum level flying speed	
Sea level, without external load	1,210 kilometers per hour

11,000 meters high altitude, without external load	M=1.12
Service ceiling (without external load)	16,000 meters
Maximum rate of climb	83 to 103 meters per second
Takeoff speed	300 to 330 kilometers per hour
Landing speed	278 to 307 kilometers per hour
Landing run	1,660 meters
Combat radius	410 to 600 kilometers
Maximum overload	
Without external load	7.5 g
With auxiliary fuel tanks	6.5 g
With full auxiliary fuel tanks and bombs	5 g
Maximum limit M number	M1.5

9727

CSO: 4008/9

DETAILS OF EXPORT A-5 CLOSE-SUPPORT AIRCRAFT GIVEN

Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese No 9, Sep 84 pp 12-13

[Article: "What Is the Performance of China's 'Qiang-5'?"]

[Text] Since making its appearance, the all-Chinese designed and built supersonic attack aircraft, "Qiang-5", has drawn the close attention of foreign aviation circles. In its 26 May 1984 issue, Britain's JANE'S DEFENSE WEEKLY, published an article written by (Dean Rikson), which reported in comparative detail the technical data, structure, and performance of the Qiang-5 aircraft, which we now provide as a reference. The publishing of this article does not mean that this magazine endorses the writer's viewpoints or confirms his report, but is done only to provide our readers with foreign materials that evaluate our aviation situation.

China's state aircraft industry has a strong production capacity, but still lacks comprehensive experience in specialized designs. Before 1960, China received constant technical assistance from the USSR, but when ideological differences between the two countries appeared and armed clashes erupted between them, this assistance was suddenly cut off. Only in the past 10 years, when China has looked beyond what is made in China and has sought new Western technology in order to improve its military posture, has it become clear that the obsolete Soviet-designed equipment is more and more unsuited to the demands of its military forces.

Up until 1960, China imported or produced in its own factories a large number of military aircraft, including the MiG-17, MiG-19, MiG-21, Il-28, Tu-16, and the An-24. The various types of Soviet-produced aircraft also became the equipment for the majority of China's zhongdui. However, after losing the Soviet Union's technical help, China's first design work was to take the MiG-19 airframe and add a nose and two air intakes on either side, calling the design modification the 'Qiang-5'. It was to perform an attack role.

It is said that 500 Qiang-5's are in service in Chinese units. In 1983, China began to export this aircraft, the export model being called the A-5. Pakistan's first order was for 42 A-5's, with which it equipped three squadrons. Its orders have now increased to 60 A-5's, and the 16th

Squadron stationed in (Lafeiqi Shaokete) was the first squadron to be equipped with A-5's. A second, newly formed A-5 squadron, had been sent to the (Masilu) Air Force Base.

The West long ago knew of the existence of this aircraft, its NATO designation being the Fantan-A, but mistakenly thought it to be the F-9, or a modified F-6. When a U.S. aircraft industry delegation visited China in 1980, Chinese reception personnel briefed the delegation on the true name of the aircraft at the Nanchang factory that produces it. To sell the A-5 abroad, China has provided all the technical data on it. We can now publish some photographs on the aircraft's structure and equipment as well as the experiment and design facilities used in its development.

For the Qiang-5, a large amount of redesigning was done on the airframe of the Jian-6 (China's production model of the MiG-19), with the improvements mainly concentrated in the mid-fuselage and forward fuselage. The aircraft is about 25 percent longer than the Jian-6. First, the forward fuselage was lengthened in order to add a weapons bay. It is known that the Qiang-5 produced in the early stage had a weapon bay, but the Qiang-5 produced in the recent stage uses this space to store fuel. The main improvements that make the exterior of the Qiang-5 completely different from the original model is that the [single] air inlet for the two WP-6 engines (similar to the early-stage Jian-6) has been changed to two lateral air inlets and a pitot boom has been fitted on the front of the elongated nose. The way the cockpit canopy is opened is different from that of the Jian-6, and the back sweep of the cockpit makes the dorsal fin smaller and the vertical tail larger. The entire fuselage is very clean, particularly on the latest export models, and the small bleed holes and air admission holes have been removed. But the present Jian-6 and the early-stage Qiang-5 have these air holes. The Qiang-5 has been refitted with a drogue chute located in the same position as that of the later-stage Jian-6, just under the rudder.

The main technical specifications of the A-5 export model provided by China are: wingspan 9.70 meters, length (including pitot boom) 16.727 meters, length (without pitot boom) 15.65 meters, height 4.51 meters, weight empty 6,494 kilograms, and maximum takeoff weight 9,530 kilograms. Carrying all its external load, the A-5 can take off at a weight not exceeding 12,000 kilograms. The mean aerodynamic chord of the wing is 3.097 meters, and the aircraft can operate with the center of the mean aerodynamic chord limited to between 31.5 percent and 38 percent.

The China National Aero-Technology Import and Export Corporation is China's sales department and the postal address of its general headquarters is P.O. Box 1671, Beijing. The A-5 introduced by this corporation is a single-seat, twin-engined supersonic attack aircraft. Its main mission is, at low altitude or minimum flying altitude, to make a high-speed penetration of the enemy's line of defense and carry out close air support for ground units. It can attack with bombs or rockets various ground targets, for example: infantry assembly points, rocket or missile launching sites, air force bases, communications and liaison centers, coastal shipping, and tank zhongdui. It is able at level flying or diving to execute its air-to-surface mission, and it uses air-to-air missiles and guns for self-defense.

The A-5 can perform aerobatics and has great maneuverability. At sea-level its maximum level flying speed is 1,210 kilometers per hour (with external load and with afterburning). At an altitude of 11,000 meters, it can fly at Mach 1.12 (without external load and with afterburning), or 1,190 kilometers per hour. At an altitude of 5,000 meters, its maximum climbing rate is 4,980 to 6,180 meters per minute (without external load and with afterburning), and its service ceiling is 16,000 meters.

Its takeoff speeds are 300 kilometers per hour (without external load and with flap at 15°) and 330 kilometers per hour (with full external load and with flaps at 25°). The takeoff distances are 700 to 750 meters (without external load and with flaps at 15°). And 1,250 meters (with full external load and with flaps at 25°). Its landing speed (using the brake-chute and with flap at 25°) is 278 to 307 kilometers per hour, and the landing run is 1,060 meters.

At an altitude of 11,000 meters, the A-5's range (with auxiliary fuel tanks at maximum fuel capacity) is more than 2,000 kilometers. The high-low-high operational radius (with full external load and without additional power) is 600 kilometers, and its low-low-low operational radius (with full external load and without afterburning) is 400 kilometers. The overloads are 7.5 g (without external load), 6.5 g (with empty auxiliary fuel tank), and 5 g (with full bomb load or full auxiliary fuel tank). Its maximum limit Mach number is 1.5.

The two WP-6 engines are China's production models of the Soviet Union's Tumansky/Mikulin R-9BF-811 engine and are installed side by side in the rear fuselage, and have a maintenance interval of 200 flying hours. The rated power without afterburning is 2,600 kilograms, the afterburning rated power is 3,250 kilograms; fuel consumption rate is 0.94 without afterburning and 1.6 with afterburning.

The fuselage is of regular stress skin structure, is manufactured in two separate parts, and can be opened behind the wing's trailing edge, providing access to the engines. Fuselage mid-section waisting meets area-rule requirements for transonic speeds. Certain cockpit areas have armor protection so that the pilot can survive gunfire attacks.

The sweep angle of the center monoplane at one-fourth of the chord is 52.50°, and its tab has an anhedral angle of 4°. The wing's area is 27.95 square meters, and the span-chord ratio is 3.37. The wing is a stressed-skin, multi-spar box structure with recessed inboard flaps and outboard ailerons; there is 2 full-chord fence on each wing.

The all-moving tailplane is on the upper part of the rear fuselage, and its total area is 8.62 square meters with a moveable area of 5 square meters. The total area of the vertical tail and the rudder is 4.64 square meters. The hydraulically-operated wide-track landing gear is of the single-wheel type and is fitted with oleo-pneumatic shock absorbers. The main landing gear retracts into the wing, and the nose gear retracts forward into the fuselage.

The A-5 has five internal fuel tanks, three in the forward fuselage and two in the rear fuselage, with a total internal fuel capacity of 3,720 liters. A 760-liter auxiliary fuel tank can be attached to each pylon on the inner side of the underwing, and when bombs are attached to the inboard pylons a 400-liter auxiliary fuel tank can be attached to each outboard pylon.

The working pressure of the hydraulic system is 210 kilograms per square centimeter. The main hydraulic system telecontrols the landing gear's lowering and retraction, the flaps, the speed brakes, and the afterburner jet pipe. The auxiliary hydraulic system drives the booster for the ailerons and the all-moving tailplane. But the rudder is mechanically operated, with the trim tabs for the ailerons and rudder being operated electrically.

The A-5 has eight external attachment points, four under the wing and four under the fuselage. Fuselage attachment points can carry a 250-kilogram bomb (China's 250-2, the U.S. MK 82, "Snake-Eye," or France's Durandal.) An attachment on the inner side of the wing can carry a 500-pound or 700-pound bomb; and can also carry a 57mm, 68mm, or 90mm rocket launching unit. After being refitted, a wing outboard attachment point can carry an AIM-9 "Sidewinder" or a "Matra R550 [Magic]" air-to-air missile. A 23mm cannon is mounted in each wing root, with each cannon having 100 rounds. An SH-1J optical sighting device can be used for level and dive bombing or for firing air-to-surface rockets. The normal ammunition and bomb load capacity is 1,000 kilograms, but the maximum can be 2,000 kilograms.

According to the manufacturer's briefing, experimental work was widely conducted during the process of developing the A-5.

9727

CSO: 4008/10

MEASUREMENTS OF X-RAY SPECTRA FROM LASER PRODUCED PLASMA

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS] in Chinese Vol 4, No 2, 15 Jun 84 pp 102-107

[Article by Yang Jianguo [2799 1696 0948] and Li Ruolan [2621 5387 5695]]

[Text] Abstract

The continuous X-ray spectra from 1.5 to 100 keV emitted by a laser produced plasma have been measured with a K-edge filter and a filter fluorescence arrangement. In this report the methods for measuring the X-ray spectra from laser produced plasma and the multichannel X-ray spectrometer are described. Experimental results of laser fusion experiments are presented.

I. Introduction

The X-ray emitted from laser induced high temperature high density plasma has provided a wealth of information about the interaction of laser with matter and about plasma characteristics. The measurement of the continuous spectrum of X-ray is very useful in the determination of the X-ray conversion efficiency and the understanding of the laser absorption mechanism, the energy distribution of electrons and superheated electrons in plasmas and the comparison with theoretical models.

The X-ray spectrum¹⁻³ from a laser plasma contains soft X-rays below a few keV and hard X-rays above a few keV. We developed a multichannel spectrometer to measure the X-ray spectrum above 1.5 keV. The spectrometer uses 11 channels of K-edge filters and 10 channels of filter fluorescence to measure the X-ray energy. Using this spectrometer, we have measured the spectrum of the 1.5-100 keV X-ray emitted from a laser plasma produced by illuminating several targets with a 10^{13} - 10^{15} W/cm², 100 ps, 1.06 μ m neodymium glass laser. The X-ray in this region consists of two parts, each following approximately a power law in energy. The low energy thermal component is attributed to the plasma bremsstrahlung and photon induced recombination, characterized by a Maxwell distribution with an electron temperature T_e . The high energy thermal component is attributed to the bremsstrahlung of the superheated (or high energy) electrons and gives the effective temperature T_h of the superheated electrons.³

Experimental measurements showed that radiating glass shell and high Z targets with a short pulse laser with 10^{14} - 10^{15} W/cm² power density clearly produced superheated electrons. The energy distribution of the superheated electron from a high Z target is even higher, indicating the existence of an anomalous absorption mechanism in the generation of the superheated electrons.

II. Measurement Principles

1. K-edge filter method

The principle of the K-edge filter method (KF for short) makes use of the sudden change of the absorption coefficient at the K-edge energy E_k^1 (see Figure 1(b)) and changes a continuous X-ray spectrum into a narrow band spectrum after filtering, see Figure 1(c). Using a set of filters with different K-edge energies, energy distribution can be achieved. Subsequent detection of the transmitted X-ray photons with a detector yields multi-channel signals directly correlated with the incident spectrum.

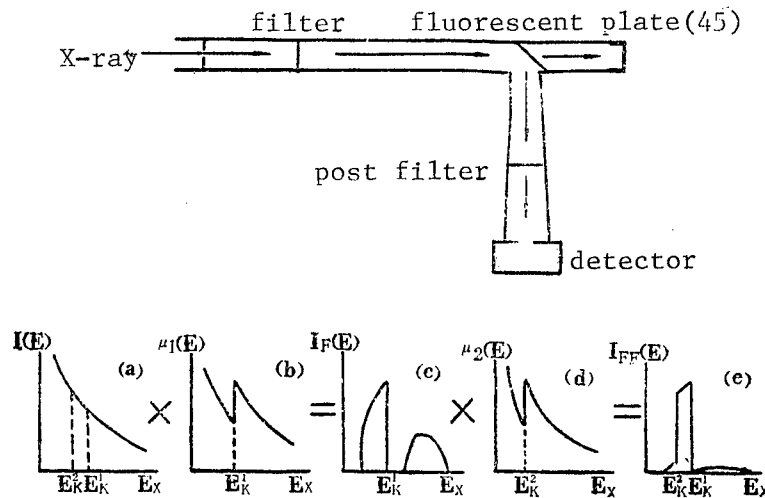


Figure 1. Measurement Principle of the Filter-Fluorescence Method

- | | |
|-------------------------------|-----------------------------------|
| Key: (a) Incident X-ray | (d) Absorption coefficient of the |
| (b) Absorption coefficient of | fluorescent plate |
| the filter | (c) Filter-fluorescence spectrum |
| (c) Filtered X-ray spectrum | |

In the energy region of interest the intensity of the X-ray decreases monotonically and rapidly as the photon energy increases. By choosing the proper thickness of the filter and the sensitivity of the detector, the output signal may be made to consist of X-rays generated mainly in the narrow energy band just below E_k^1 and the contribution of the transmitted X-rays with energies greater than E_k^1 can be made as small as possible. In order to separate the contribution of the high energy portion, a spectrum iteration method²

Let $I(E)$ be the incident spectrum to be measured, M_i be the i th channel output signal of the spectrometer (charge or amplitude) and $R_i(E)$ be the response function of the i th channel (discussed in detail later), defined as the charge or amplitude output of the i th channel caused by a unit energy of the X-ray of photon energy E , then, we have

$$M_i = \int_{E_{\min}}^{E_{\max}} I(E) R_i(E) dE \quad (i=1, 2, \dots, N_c.)$$

where E_{\max} and E_{\min} are the upper and lower limits of the photon energy in the spectrum, and N_c is the number of channels of the spectrometer. The inversion process is to solve the above integral equation and find the incident spectrum based on known M_i and $R_i(E)$. Since N_c is only a small number of channels and both the measured values Y_i and the values of $R_i(E)$ are subject to errors, attempts to solve the integral equation by purely mathematical means will encounter instability difficulties in the solution. For this reason, additional information must be added in the iteration process. The iteration method mentioned earlier makes use of the a priori information about the X-ray spectrum and the initial guess is repeatedly corrected in the iteration until it agrees with the measured Y_i to some specified accuracy. The initial guess of the spectrum may be an exponential function based on the general power law dependence of the X-ray energy or it also may be some other function chosen on the basis of some theoretical calculation and analysis.

The K-edge filter method¹⁻³ is characterized by the wide energy range it can measure, the ease of adjusting the channels, the high sensitivity and the simplicity of the operation. However, it has a low resolution in energy and relies heavily on the spectrum shape. In the inversion process, spectra that decrease gradually require extensive data processing.

2. Filter-fluorescence method

The filter-fluorescence method (or FF method for short) is schematically illustrated in Figure 1. The filtered X-ray impinges on the fluorescent plate. Since only the X-ray with an energy greater than the K-edge energy E_k^1 of the fluorescent material can cause the fluorescent plate to emit the K series fluorescent light K_x and the X-ray with less energy can only excite the L series fluorescence, the lower limit of the detected X-ray energy is E_k^2 . Because X-ray with an energy much greater than E_k^2 correspond to a low yield of fluorescence, very little K_x higher than the high energy tail of E_k^2 will be detected after filtering, the upper limit of the detected X-ray energy is determined by E_k^1 . As a result, the K_x fluorescence is mainly determined by a narrow range of X-ray between E_k^1 and E_k^2 , see Figure 1(e). The intensity of the X-ray between E_k^1 and E_k^2 can be obtained by measuring the fluorescence signal and by properly choosing the material and thickness of the filter and the fluorescent plate. The spectrum of the incident X-ray can be obtained by choosing a number of filters and fluorescent plates.

As compared to a single filter, the filter-fluorescent plate combination produces a narrow band fluorescent light with specific upper and lower limits

and very little X-ray exists in the low energy and high energy regions. The low energy X-ray may be filtered out with a post filter and the high energy X-ray may be handled according to the incident spectral shape. The influence of rapidly decreasing spectrum may be often ignored and other spectral shapes may be inferred. As can be seen, the FF method has a high resolution of energy and a low sensitivity, it is particularly suited for the measurement^{4,5} of high-flux, high-energy X-rays, but the operation of the spectrometer is much more complex than the KF method.

III. Spectrometer

1. Construction of the spectrometer

The construction of the spectrometer is shown in Figure 2. On an annular solid of 370 mm outer diameter and 220 mm inner diameter, 10 channels of filter-fluorescent detectors are installed to form a 10 channel FF spectrometer. The fluorescent radiation passes through a post filter and a collimator and enters the fluorescent detector. The straight-through X-rays passing through the fluorescent plate are absorbed in the light trap. An 11 channel KF spectrometer can be formed by removing the fluorescent plate and the trap and by installing the detector at the bottom.

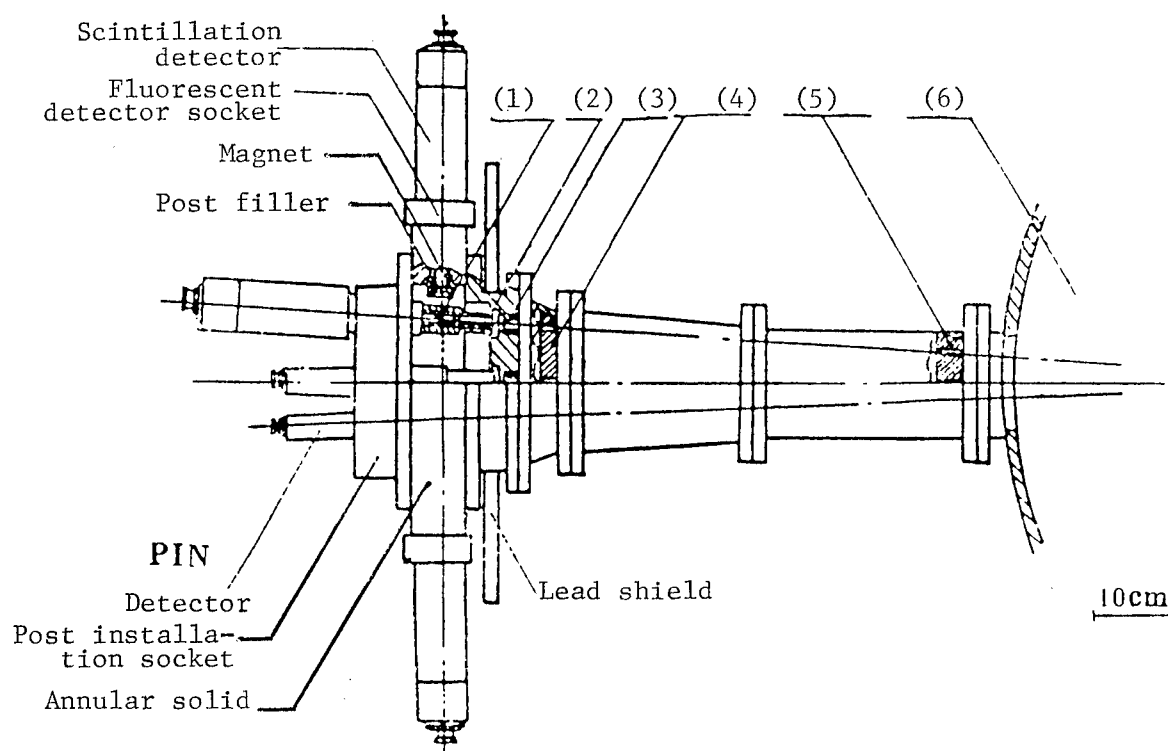


Figure 2. Multichannel X-ray Spectrometer

Key:

- | | |
|-----------------------|--------------------|
| (1) Fluorescent plate | (4) Lead shield |
| (2) Magnet | (5) Collimator |
| (3) Filter | (6) Target chamber |

A 2 kG magnet ($1 \text{ G} = 10^{-4} \text{ T}$) is placed behind the filter and the fluorescent plate to deflect the photoelectrons emitted by the plate. At suitable locations lead shields are installed. The output signal and the operating input voltage are transmitted with double-shielded cables. The spectrometer may be pumped down to 10^{-5} torr ($1 \text{ torr} = 133.3 \text{ Pa}$).

Two types of detectors are used in the spectrometer, PIN diode detectors are installed on channels below 10 keV and CsI (Ti) scintillator and model XP1110 photomultipliers are installed on channels above 10 keV. Tables 1 and 2 list the filter and fluorescent plate parameters and the detector layout.

Table 1. Filter and Detector Layout of the KF Spectrometer

Channel	Filter	K-edge keV	Filter thickness μm	Detector
K0	Al	1.56	13.8	PIN
K1	Ti	4.96	24.9	PIN
K2	Fe	7.11	19.6	PIN
K3	Cu	8.98	19.2	PIN
K4	Zn	9.66	35.3	PIN
K5	Ge	11.1	54	PIN
K6	Y	17.0	203	1mm CsI scintillator
K7	Sn	29.2	194	1.2mm CsI scintillator
K8	Sm	46.9	391	1.2mm CsI scintillator
K9	W	69.5	294	4mm CsI scintillator
K10	Pb	88.0	657	5mm CsI scintillator

2. Detector calibration

The sensitivity of the scintillation detector is calibrated with ^{55}Fe , ^{238}Pu , ^{241}Am and ^{55}Co X-ray sources using a single particle counting method. The basic approach is to find the average amplitude of the average output charge of the detector in the response to a single particle from the response spectrum of the detector to single energy particle stream and the weighted average of the single particle output amplitude. When a pulsed particle beam impinges on the detector, the detector output is taken to be the sum of the single particle outputs as long as the interaction time is much shorter than the detector response time. Therefore, under the operating conditions of our spectrometer, the sensitivity calibrated using the single particle counting method may be taken as the detection sensitivity of the pulsed particle beam. This calibration does not require intense radiation source and is easy to implement. But the measurement difficulty (mainly for the low amplitude spectrum region) is increased because the calibration requires a good measurement of the complete energy spectrum of the detector. The root-mean square error of the calibration is $\pm(11-16)$ percent. In order to obtain the sensitivity curve for the

Table 2. Filter, Fluorescent Plate and Detector Layout of the FF Spectrometer

Channel	Energy keV	Filter thickness μm	Fluorescent plate thickness μm	Post filter thickness μm	Detector
F1	1.6-2.2	Zr 5.9	Al 6.5		1mm CsI scintillator
F2	5.0-7.1	Fe 12.2	Ti 24.9		1mm CsI scintillator
F3	7.1-9.0	Cu 19.2	Fe 6.4		1mm CsI scintillator
F4	9.0-11.1	Ge 54	Cu 6.4	Al 6.5	1mm CsI scintillator
F5	17.0-20.0	Mo 80	Y 102	Zr 5.9	1.2mm CsI scintillator
F6	25.5-29.2	Sn 118	Ag 48	Al 28.5	1.2mm CsI scintillator
F7	46.9-53.8	Dy 211	Sm 98	Ti 24.9	4mm CsI scintillator
F8	61.3-69.5	W 145	Yb 104	Fe 19.6	5mm CsI scintillator
F9	80.7-88.0	Pb 329	Au 87	Fe 19.6	5mm CsI scintillator
F10	Spare	(U)	(Pb)		

1.5-200 keV range, we fitted the four calibration points to a curve based on physical considerations. For the 1.5-5.9 keV range, no data were available and the fitted curve was extrapolated. A typical sensitivity curve is shown in Figure 3.

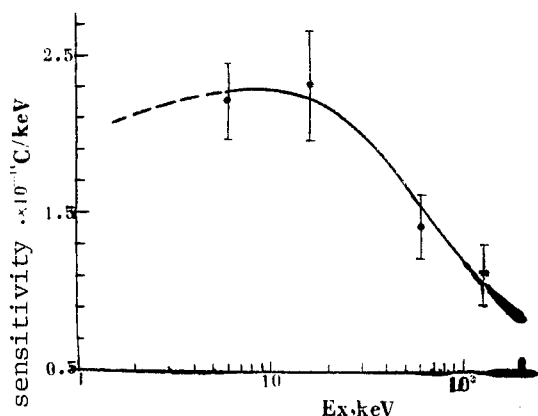


Figure 3. Sensitivity Curve of the Scintillation Detector

ϕ 20 x 1.2mm CsI + XP 1110, $V_H = +1.6$ kV

• — Calibration data, - - - - fitted curve, --- — extrapolation

For the current output type PIN detector, we used the standard calculated sensitivity because it agreed well with the experimental value. The sensitivity (keV/V) of the voltage output type PIN detector with a charge sensitive amplifier is calibrated with a ^{239}Pu source using an output waveform amplitude method under the actual operating conditions of the spectrometer.

3. Response function

The response function⁵ depends on the physical measurement process and the detector sensitivity function of the spectrometer; it exhibits the overall characteristics of the spectrometer. To illustrate the applicability of the K-edge method in the measurement of monotonic rapidly dropping spectrum, we plotted, in Figure 4, the calculated response output (the product of the response function and the incident spectrum) for 5 typical channels of the KF spectrometer assuming the incident spectrum consists of two exponential terms e^{-E/T_e} and e^{-E/T_h} . As can be seen, for steeply dropping spectra, the signal contribution of the K-edge energy band can be made 90 percent or higher if the filter parameters and the detector layout are properly chosen. Under such circumstances, the response function can usually be treated with a δ approximation. Even though this makes the spectrum data error somewhat greater, it does simplify the spectrum inversion calculation.

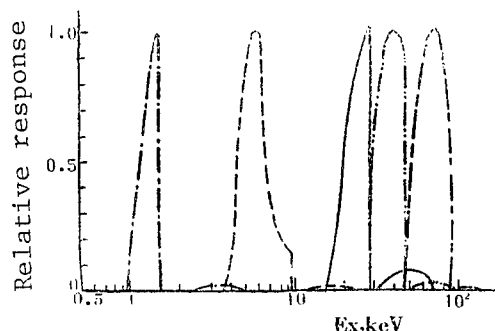


Figure 4. Channel Response Output of the K-edge Spectrometer

X spectrum, $T_e = 0.5$ keV, $T_h = 10$ keV

— • —	13.8 μm Al, PIN
— — —	35.3 μm Zn, PIN
————	194 μm Sn, scintillator
— • —	391 μm Sm, scintillator
— — —	657 μm Pb, scintillator

Figure 5 shows several response functions of the FF spectrometer. In order to illustrate the unique features of the filter-fluorescence method, the detector sensitivity was taken to be a constant in calculating the curves in Figure 5. These response functions quantitatively showed the characteristics of the FF method discussed earlier. When the actual sensitivity functions of the various channels are included in the calculation of the response functions, the output signals are mostly coming from the integrated energy of the band

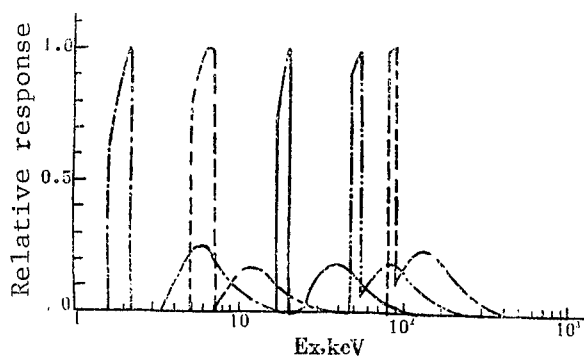


Figure 5. Response Function of the FF Spectrometer

———— • ————	6.5 μm Al, 5.9 μm Zr
— — — — —	24.9 μm Ti, 12.2 μm Fe
—————	102 μm Y, 80.1 μm Mo
———— • ————	97.9 μm Sm, 211 μm Dy
— — — — —	8.71 μm Au, 329 μm Pb

determined by the filter and the fluorescent plate even if the spectrum to be measured has a somewhat gradual drop.

The response functions show that the energy resolution of the FF spectrometer is well defined but the resolution of the KF spectrometer depends on the spectrum to be measured and the filter thickness. In addition, the energy resolution and the energy band integrated energy go against each other, a higher resolution is achieved at the cost of intensity and a compromise must be made according to the specific application. When the spectrometers are operated using the parameters listed in Tables 1 and 2, the FF method has a resolution of 10-35 percent and the average resolution of the KF method for several spectra of interest is 20-40 percent.

4. Recording system

Figure 6 shows the block diagram of the recording system. The charge sensitive preamplifier and the main amplifier are used only for the low intensity spectrum in the glass shell and CD_2 experiment. The multichannel integrated amplifier digital converter or the amplitude-amplitude digital converter changes the detector output charge or the analog amplifier output into the corresponding voltage. The signals are then fed into the ADC according to the channel number, converted into numbers, displayed on the digital recorder and monitor, and printed out on the printer. The detector output signals are also displayed on an oscilloscope and the waveforms photographed and compared to the digital values. The relative discrepancy is about 5 percent for the amplitude-amplitude conversion and 4-5 percent for the integration amplitude conversion.

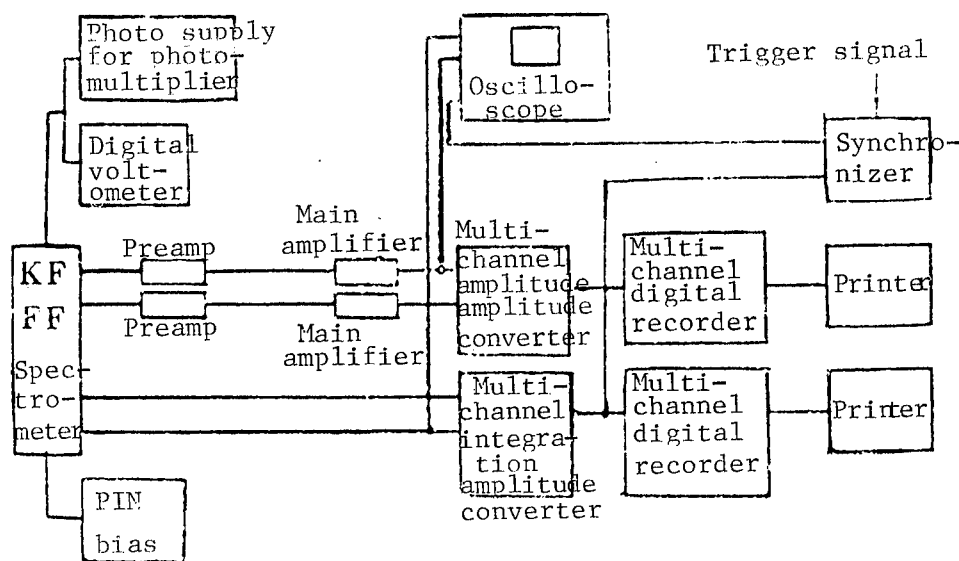


Figure 6. Block Diagram of the Multichannel KF/FF X-ray Spectrometer

IV. Experimental Results

In our experiment the laser beam energy was 5-15 J, the pulse width was 100 ps and the power density was 10^{13} - 10^{15} W/cm². The spectrometer was installed on a target chamber flange, making an angle of 55° with the laser beam. The detection radius was 110 cm and the target chamber pressure was 5×10^{-5} torr.

The FF spectrometer used only 5 channels and, because of other reasons, the KF spectrometer usually devoted only 8-9 channels for spectrum measurement. Figures 7 and 8 show the X-ray spectrum for several targets recorded by the two spectrometers. The linear extrapolation of the spectral curves in Figures 7 and 8 is based on the recognition of the approximate power law behavior of the high energy X-ray in the energy range of interest. The electron temperature T_e is 0.8-1 keV, the superheated electron temperature T_h is 5-14 keV and the temperature may vary for different atomic number of the target material and for different laser parameters. The kink in the slope (the dividing line between heated and superheated) occurs in the neighborhood of 7-8 keV. In terms of the total X-ray energy, high energy X-ray with energy greater than 10 keV account for only less than 1 percent and the total energy of the 10-100 keV X-ray is generally only 2 percent of the total energy of the 1.5-10 keV X-ray.

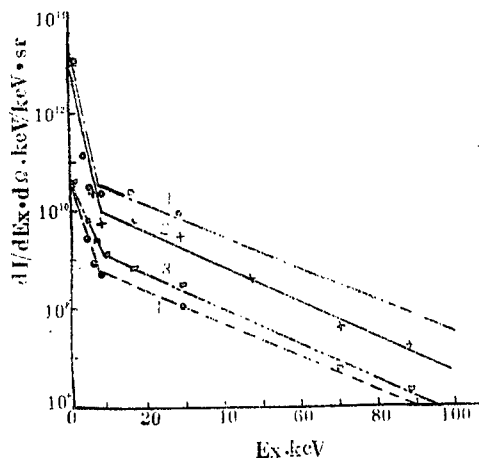


Figure 7. X-ray Spectrum Measured by the Multichannel K-edge Filter (KF) Spectrometer

Laser pulse width = 100 ps, the laser energies E_1 obtained from the empirical fitting of the experimental points are

1. Ta(plate), $E_1 = 6.5$ J;
2. Fe(plate), $E_1 = 8.9$ J;
3. Glass shell $E_1 = 10.7$ J;
4. CD (sphere) $E_1 = 11.8$ J.

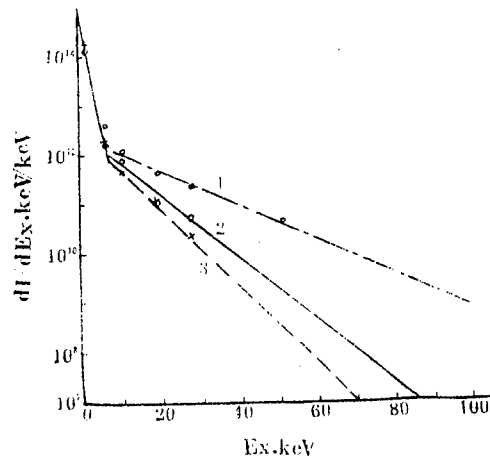


Figure 8. X-ray Spectrum Measured by the Multichannel Filter Fluorescence (FF) Spectrometer

Target: Au, laser pulse width = 100 ps, empirical fit of experimental data:

1. $E_1 = 15.3$ J;
2. $E_1 = 13.0$ J;
3. $E_1 = 10.0$ J.

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ESTIMATE OF NUCLEAR-PUMPED X-RAY LASER MECHANISM

Chongqing HEJUBIAN YU DENG LIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS] in Chinese Vol 4, No 2, 15 Jun 84 pp 86-90

[Article by Lu Renxiang [4151 0088 4382] of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] Abstract

It is proposed that the recently reported 14\AA X-ray laser is due to the $n = 5$ to $n = 3$ transition of the recombining hydrogen-like plasma of $Z = 30$ (zinc). When the stimulated radiation builds up, the size of the reacting material is about $\phi 3.36\text{mm} \times 2\text{mm}$. The X-ray flux of the nuclear explosion should be greater than 10^{15} W/cm^2 with an energy greater than 12.2 keV , the total ionization energy of zinc. Miniaturized hydrogen bomb of several hundred tons of TNT might have been used. It is suggested that the zinc wire may be doped with selenium to strengthen the 14\AA X-ray laser by resonant optical excitation.

I. Introduction

On 23 February 1981 the American magazine AVIATION WEEKLY reported¹ that at the Nevada underground nuclear testing site a nuclear pumped high-density atomic material produced 14\AA X-ray laser. The pulse width was a few nanoseconds, the power was about 10^{14} W , the material diameter was about $0.9\text{--}2.4\text{m}$ long and had a small diameter. After this report appeared, foreign journals have published a number of comments questioning the reported time. We believe that this report is reliable and it marks a major breakthrough in laser development. The significance of an X-ray laser is far-reaching.

G. Chapline² of the Lawrence Livermore Laboratory in the United States has long believed that the most promising transition for an X-ray laser is the transition of an almost totally stripped atom with a medium Z value. Moreover, recent analysis³ appeared in Soviet journal also believed that the 14\AA X-ray laser is due to a three-body recombination mechanism of hydrogen-like plasma.

The physical process of nuclear-pumped X-ray laser is roughly as follows. Under the X-ray and γ -ray radiation from a 10 nx nuclear explosion, the electrons of atoms in a thin metal wire (or an alloy composite target) are stripped off and leave a large number of vacancies, the inner shell vacancies are then filled by electrons that were not stripped off and produce K, L..... fluorescence and Coster-Kronig effect Auger electrons. The fluorescence yield increases as the degree of ionization increases. The stripped electrons in the pumping process may recombine and be stripped off again. The overall trend is that the stripping increases until the atom is totally ionized. The variation of specific physical parameters from a neutral atom to a totally stripped atom will not be discussed here.

After the nuclear pumping, the totally ionized wire-shaped plasma undergoes adiabatic expansion and the electron temperature decreases rapidly. When the three-body recombination relaxation time is greater than the expansion relaxation time, the number of particles with a high quantum number in the three-body recombination increases rapidly and, under suitable plasma operating conditions, the gain in the plasma column leads to an avalanche in the axial direction and the spontaneous emission amplification.

In outer space the material damage due to high intensity X-ray far exceeds that of ordinary laser weapons. This is because the material absorbs almost all the X-ray and produces electron-hole pairs. Consequently the electrical conductivity of the insulator increases and the semiconductor breaks down. The photoelectrons generated in the crystal by the X-ray may also cause atomic displacement and defects; when the defects accumulate to a certain extent, large amount of energy is released in a short time and causes spontaneous failure of the material (this is known as the Wigner effect⁴). X-ray not only suffers less diffraction than optical frequency laser, it also generates highly destructive shock wave when it hits a high speed target.

II. Working Substance and Plasma Parameter Analysis

1. Determination of the working substance

We assume that the 14\AA X-ray is produced by a hydrogen-like three-body recombination mechanism and fit the $\lambda = 14\text{\AA}$ wavelength to the transition frequency $\omega_{nm} = \frac{2\pi E_H Z^2}{h} \left(\frac{1}{m^2} - \frac{1}{n^2} \right)$ of the hydrogen-like ion, here $E_H = 13.6 \text{ eV}$ is the ionization energy of a hydrogen atom. We found two candidates with approximately the right wavelength; zinc ($z = 30$), principal quantum number $n = 5-3$, transition wavelength $\lambda_{53} = 14.25\text{\AA}$ and nickel ($z = 28$), $n = 6.3$, $\lambda_{63} = 13.96\text{\AA}$. We now explore the first possibility.

2. Determine the operating range for the $n = 5.3$ transition

Based on a rate equation, people have calculated the effect on the plasma parameter upon entering the $n = 5-3$ transition inversion region from the totally ionized state, the results are shown in Figure 1. The abscissa is the reduced electron density $\eta_e = n_e/z^7$ and the ordinate is the reduced ground state ion density $\eta_1 = n_1/z^2$, the reduced electron temperature is

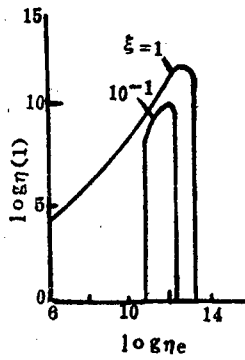


Figure 1. Allowed Inversion Region of the Hydrogen-like $n = 5-3$ transition for $\theta = 2$ eV and Different Self-absorption

represented as $\theta = T_e/Z^2$. The parameter ζ in Figure 1 is the radiation attention factor due to self-absorption in the plasma. The curve encloses a region of population inversion for a given transition energy.

Figure 1 shows that the allowed electron density and electron temperature for totally ionized zinc plasma to enter the hydrogen-like $n = 5-3$ transition by adiabatic expansion are respectively

$$n_e = 4.5 \times 10^{11} \times Z^7 = 10^{22} / \text{cm}^3, \quad I_e = 2 \times Z^2 = 1.8 \text{ keV}.$$

For the plasma to achieve population inversion by three-body recombination, n_e and T_e must satisfy one constraint,⁶ that is, the collision limited principal quantum number P_L must be between the chosen principal quantum numbers of the transition and P_L must satisfy the following transcendental equation:

$$P_L = 1.26 \times 10^4 Z^{14/17} n_e^{-2/17} (kT_e/Z^2 E_{II})^{1/17} \exp(4Z^2 E_{II}/17P_L kT_e).$$

The value of P_L was computed to be 4.78, satisfying the $5 > P_L > 3$ condition.

Using the following coupled equations (where n_e and T_e are known) and the three constraints, the four initial unknown parameters (T_{e0} , n_{e0} , r , r_0) of the plasma before the adiabatic expansion can be inferred. Here r_0 is the radius of the plasma column.

$$\begin{cases} (n_e/n_{e0})^2 = (T_e/T_{e0})^3, \\ r^2 n_e = r_0^2 n_{e0}, \\ r = r_0 + v \times \tau, \\ r_0 = 1/\sigma \times (n_{e0}/Z)_0. \end{cases}$$

Here, $\tau = 1.53 \times r_0 \times 10^{-6} \sqrt{A/(Z+1) kT_{e0}}$ is the adiabatic expansion relaxation time, $v = \sqrt{(Z+1)kT_{e0}/Am_p}$ is the expansion speed, A is the atomic mass and σ is the photoelectric absorption cross-section.

The first equation in the simultaneous equations is the adiabatic expansion requirement, the second equation shows that in a slender plasma wire, the electron density is a constant on a unit length, the third equation represents the radial expansion of the wire and the fourth equation is the condition that the pump X-ray and γ -ray are effectively absorbed.

The three constraints are:

(a) $\tau_\beta \gg \tau$, τ_β is the three-body recombination relaxation time, $\tau_\beta = 1/\eta_e^2 \beta$, $\beta = 10^{-31} \frac{P^4}{Z^6} \left(\frac{Z^2 E_H}{kT_e} \right)^2$. This shows that the adiabatic expansion is faster than the three-body recombination.

(b) $\eta_{e0} < N_{e0}$, N_{e0} is the electron density in the solid.

(c) $r \gg \sqrt{\ell \lambda}$, ℓ is the length of the plasma wire, taken to be 2m. This condition sets the diffraction loss limit.

The self-consistent solution obtained may be expressed graphically in Figure 2 and listed numerically in Table 1. The radius R of the initial solid zinc wire is found by requiring the ion density on a unit length to be a constant.

As can be seen in Figure 2, the electron temperature of the plasma column increases during the nuclear explosion (assumed to last 10 ns) and reaches its maximum at the end of the explosion. Finally, by adiabatic expansion, the temperature decreases rapidly to the particle number inversion zone for the $n = 5-3$ transition.

Over the entire process the electron density decreases monotonically and the radius of the zinc wire increases monotonically.

For a zinc wire 2m long, the directionality of the spontaneous emission amplification X-ray laser is $\alpha = 2r/e = 1.68$ mrad.

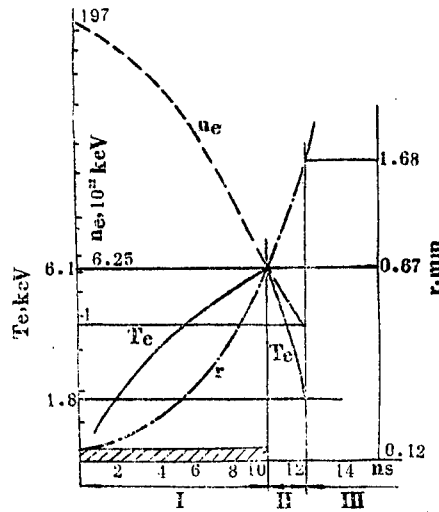


Figure 2. Physical Changes in the Nuclear Pump and Adiabatic Expansion Process

- I. Nuclear pump time
- II. Adiabatic expansion
- III. Onset of laser output

The dashed line shows the variation of the electron density, the solid line shows the change of the electron temperature, and the dash-dot line shows the radius of the zinc wire.

Table 1. Plasma Parameter Solutions for the Nuclear Pumped and Adiabatic Expansion Process

	t = 0 before pump	t = 10ns after pump initial adiabatic expansion state	t = 11.9ns final adiabatic expansion state
Zinc wire radius (mm)	R = 0.12	r = 0.67	r = 1.68
Electron temp (keV)	room temp	$T_{e0} = 6.1$	$T_e = 1.8$
Electron density (1/cm ³)	$N_{e0} = 1.97 \times 10^{24}$	$n_{e0} = 6.25 \times 10^{22}$	$n_e = 10^{22}$

III. Estimate of the Explosion Tonnage and Discussion

The ionization energy⁸ of a single zinc atom is $E = 4.86 \times 10^4 \text{ eV} = 7.8 \times 10^{-15} \text{ J}$, therefore the energy needed to totally ionize a zinc wire of $\phi 0.24\text{mm} \times 2\text{mm}$ is

$$E = 7.8 \times 10^{-15} \Delta v N_Z$$

where Δv is the volume of the initial solid zinc wire and N_Z is the number of ions per unit volume. It is easy to show that $E = 4.6 \times 10^7$ J and the energy that can be transformed into X-ray laser energy is

$$E_1 = 4.6 \times 10^7 \times \frac{870}{4.86 \times 10^4} \times \frac{\Delta N}{N_i}.$$

Here ΔN and N_i are respectively the inverted particle number at the onset of the X-ray laser and the ion density ($N_i \doteq n_e/30 = 3.33 \times 10^{20}/\text{cm}^3$). In order to satisfy the reported value of $E \sim 10^5$ J, we obtain $\Delta N/N_i = 0.12$.

The gain per unit length of the X-ray laser is

$$g_{nm} = \frac{0.667}{4\pi} \frac{g_m}{g_n} f_{nm} \frac{\Delta N}{\Delta v}.$$

where $\Delta v = \frac{c}{\lambda^2} \Delta \lambda$, and $\Delta \lambda$ is determined mainly by the Stark broadening of the hydrogen-like ions⁹:

$$\Delta \lambda = 8.16 \times 10^{-19} \lambda_0^2 (n_n^2 - n_m^2) (n_e/Z)^{2/3} (\text{\AA}),$$

Plugging in the numerical values, we have $\Delta \lambda = 2.19 \times 10^{-3} \text{\AA}$ and $g_{nm} = 2.72 \text{ cm}^{-1}$. It should be noted that these results are different from those in Ref. 3 and the gain is far greater than their 0.1 cm^{-1} . This is not unexpected because the calculation has already shown that the gain per unit length of the X-ray laser can be very high. For example, the calculation in Ref. 10 showed that the maximum gain, g_{\max} , is about 10^4 cm^{-1} for hydrogen-like oxygen ions.

Assume the nuclear explosion took place at a distance of 1m from the zinc wire, then, the X-ray flux for energies greater than the ionization energy of the last electron in zinc should be greater than $5.8 \times 10^{14} \text{ W/cm}^2$.

Assume the nuclear pumping source has an electron temperature of 2 keV and 13 percent of the nuclear explosion radiation (taken to be black-body radiation) are greater than 12.2 keV, then, for the above X-ray flux, the total energy of the nuclear bomb is about 10^{12} J, equivalent to that of a 500 tons of TNT thermal nuclear hydrogen bomb. (The atomic bombs dropped on Hiroshima and Nagasaki in Japan by the United States during World War II are equivalent to about 2 tons of TNT).

It has been shown in the laboratory that the resonant photoexcitation of laser heated plasma is also an effective mechanism for practice number inversion.¹¹ In our search we found that the coupling element selenium ($z = 34$) is capable of pumping the hydrogen-like zinc ions from its ground state ($n = 1$) to the excited state ($n = 5$). The wavelength of the selenium Ly line is 1.052\AA , only 4 m\AA from the $\lambda_{51} = 1.056 \text{\AA}$ of the hydrogen-like zinc ion. Using the equation given earlier, we found that the Stark broadening of the λ_{51} is also of the order of m\AA and the Ly transition of selenium partially overlaps the 5-1 transition of hydrogen-like zinc. It is therefore favorable for the stimulated emission of the 14\AA X-ray to dope the zinc wire with selenium.

The author thanks Wang Zhijiang [1769 0037 3068] and Deng Ximing [6772 6932 6900] for their help and encouragement and Zhou Zhongyi [0719 1813 4135] and Luan Xiaojin [2940 4801 6855] for computing some of the parameters reported here.

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9698

CSO: 4008/391

APPLIED SCIENCES

MELT ROCKS PRODUCED BY NUCLEAR EXPLOSION IN LIMESTONE ANALYZED

Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 3, 1984 pp 226-236

[Article by Cai Huachang [5591 5478 2490] and Chu Yucheng [5969 3768 2052] of the Northwestern Institute of Nuclear Technology, and Wang Daode [3769 6670 1795] and Xie Xiande [6200 0341 1795] of the Institute of Geochemistry, Chinese Academy of Sciences: "Minerology and Formation of Melt Rocks Produced During an Underground Nuclear Explosion in the Limestone Medium"]

[Summary] This article gives the composition of the melt rocks in an underground nuclear explosion in limestone and discusses the formation mechanism of the melt rocks.

In an underground nuclear explosion in a rock medium, a large quantity of energy is released, of the order of 10^{12} calorie per 1,000 tons of TNT equivalent. Such energy melts and vaporizes the nuclear device and the surrounding rocks. The high temperature, high pressure gas expands rapidly and pushes the rocks outward, forming an approximately spherical cavity. The molten material flows downward along the inner wall of the cavity and falls off during the rebound of the cavity wall. When the cavity top collapses, the temperature quickly decreases because of the expansion of the gas and the mixing in of the cold rocks. The melt that collects at the bottom of the cavity then solidifies. If the rock medium is carbonate, crystalline rocks are formed. If the rock medium is silicate, quasi-isotropic glassy rocks are formed.

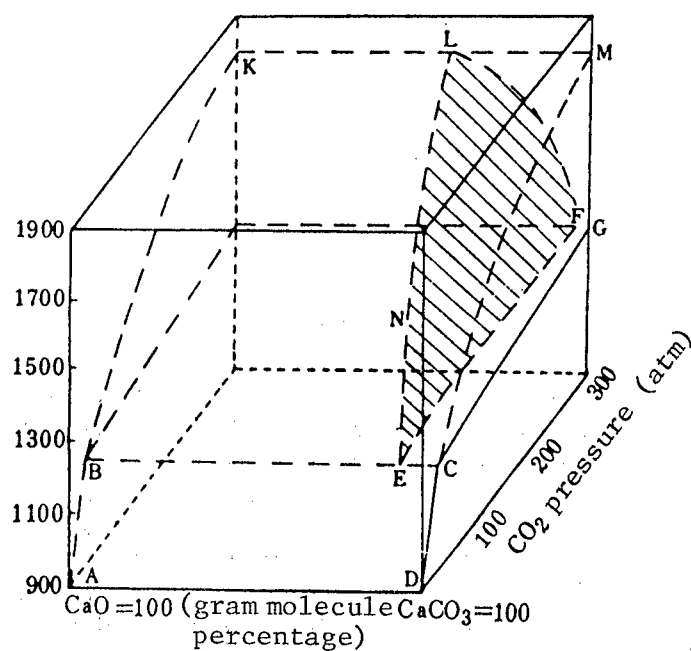
In the test, the rocks at the explosion center has a major component of calcite (CaCO_3)--more than 98 percent by weight--and small amounts of quartz, magnetite and dolomite. For measurement and safety reasons, the surrounding of the explosion chamber is back filled with andesite, iron ore, prefabricated bricks and sand bags containing feldspar, quartz and mica.

The melt rock formed in an underground nuclear explosion in a limestone can be classified into three major types: carbonate, carbonate-silicate mixture and glassy silicate. For the explosion in a limestone medium, the main component of the melt rock is carbonate and detailed studies are therefore conducted to analyze the carbonate using X-ray powder technique and electron microprobe technique. A total of about 20 monominerals are identified. The chemical

composition and the formation process are discussed for the major ones, including brownmillerite $[\text{Ca}_4\text{Al}_2\text{Fe}_2\text{O}_{10}]$, $\text{Ca}_6\text{Al}_4\text{Fe}_2\text{O}_{15}$, spurrite $(2\text{Ca}_2\text{SiO}_4 \cdot \text{CaCO}_3)$, rankinite (CaSiO_3) , α -silicon carbide (type VI), periclase (MgO) , $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$, hermatite, α -iron and magnetite, and phlogopite $(2\text{KMg}_3[\text{Si}_3\text{AlO}_{10}[\text{OH}]_2]$. Some of the minerals are rare or have not yet been discovered in nature.

To study the temperature and pressure during the cooling and crystallization of the carbonate melt, the CaCO_3 - CaO phase equilibrium diagram is used. It is found that the dissociation percentage of CaCO_3 in the melt rock is 1.9-28.95 percent and mostly in the 14-23 percent range. The temperature range for cooling and crystallization is 1600-1200°C, with the pressure range being 300-40 atmospheres.

Based on chemical analysis results, the formation process and mechanism are studied. The formation of the melt rocks can be divided into four stages: 1) The vaporization and liquefaction stage. The great amount of energy released in the nuclear explosion raises the temperature in the cavity to several million degrees and the pressure to 10 million atmospheres. The rock medium that surrounds the cavity is vaporized and liquefied. It is known that CaCO_3 dissociates upon heating; however, if the CO_2 partial pressure is greater than 40 atmospheres, then the dissociation is inhibited. Instead, it forms a mixture of molten CaO and CaCO_3 and mixed with about 8 percent of the backfill material (SiO_2 , Al_2O_3 , Fe_2O_3 , etc.). 2) The initial crystallization-cavity stripping stage. After the cavity stops expanding, part of the melt on the wall crystallizes into periclase. 22 seconds after the detonation, the cavity wall is stripped off and an accumulation of melt rocks is formed 7-20.5m below the explosion center in the cavity. After wall stripping, the cavity temperature is 1200°C and the CO_2 partial pressure is about 40 atmospheres. 3) The crystallization stage. The rapid decrease in temperature and pressure leads to the crystallization of the melt. The crystallization takes place in stages and produces different minerals at the end of the process. The solidified melt is distributed approximately uniformly at the lower part of the cavity. 4) The chimney-formation and thermal metamorphism stage. Further release of energy from the cavity causes the temperature and pressure to decrease even more. The force on the surrounding rocks near the top of the cavity changes suddenly. When the pressure in the cavity is insufficient to counterbalance the weight of the covering rocks, the cavity top collapses and forms the chimney. After the formation of the chimney, the region containing the melt rocks still has a large amount of residual heat. This heat is slowly conducted away through the surrounding rocks, making them pale, porous and undergo thermal metamorphic changes and, in the process, producing rankinite and phlogopite.



E melting point; P 39.5 atm; T 1240-1242°C CaCO₃
 88.3%; CaO 11.7%
 F-P 3000 atm; T 1308°C; CaCO₃ 97%; CaO 3%; N-P 100 atm;
 T 1457°C; CaCO₃ 80%; CaO 20%;
 L-P 300 atm; T 1800°C; CaCO₃ 60%; CaO 40%

9698

CSO: 4008/83

APPLIED SCIENCES

BRIEFS

LIAONING COMPUTER TECHNOLOGY SERVICE--The Liaoning branch of the China Computer Technology Service Company was established in Shenyang on 22 October. On the principle of mutual benefit, this specialized company will establish technical and trading cooperation with companies and production plants at home and abroad to develop the application of computers; to offer computer hardware and software; complete sets of electronic technology, including machine rooms, products, instruments and meters; and to render computer application system designing, installation, debugging, maintenance, and consulting services. [Text] [Shenyang LIAONING RIBAO in Chinese 23 Oct 84 p 1 SK]

SHANGHAI DIODE PRODUCTION--Shanghai, 30 Oct (XINHUA)--China's largest germanium diode production line went into operation at the Shanghai No 4 Semiconductor Factory Monday. The line, capable of producing 60 million diodes a year, was imported from the Unizon Corporation of Japan. It consists of 44 machines. The product is a major component for TV sets, tape recorders, and electronic instruments. [Text] [Beijing XINHUA in English 1139 GMT 30 Oct 84]

SHANGHAI RESISTOR PRODUCTION LINE--Shanghai, 6 Nov (XINHUA)--China's first computerized resistor production line went into operation at the Shanghai Radio Factory No 1 Monday. The line can produce 80 million fixed metal film resistors a year. The product is a major component in broadcasting, television and telecommunications equipment, as well as in automated instruments and meters. Key equipment for the production line was imported from the Koa Denko Co Ltd of Japan. [Text] Beijing XINHUA in English 0839 GMT 6 Nov 84 OW]

ETHYLENE PLANT INSTALLATIONS--Beijing, 3 Nov (XINHUA)--Five new installations for making caustic soda, polyvinyl chloride and other chemicals will be added to a major ethylene plant now under construction in east China's Shandong Province, under a contract signed here on Friday. This will be part of the second stage of the plant which will produce 300,000 tons of ethylene a year when the first stage construction is completed in 1986. A national key capital construction project, the plant will be operated by Shandong's Qilu Petrochemical Industrial Company. The contract was signed between the China International Trust and Investment Corporation which will invest 360 million yuan in the project and the China Petrochemical Corporation. [Text] [Beijing XINHUA in English 1044 GMT 3 Nov 84 OW]

DRUG ADDICTION TREATMENT

Guangzhou ZHONGGUO SHENJING JINGSHEN JIBING ZAZHI [CHINESE JOURNAL OF NERVOUS AND MENTAL DISEASES] in Chinese Vol 10 No 4, 20 Jul 84 pp 215-217

[Article by Cui Yuhua [1508 3768 5478] et al of Research Institute of Nervous and Mental Diseases, Beijing Medical College: "Clinical Features and Treatment of 22 Patients of Drug Addiction"]

[Summary] The control of such easily addictive substances as morphine has been rather satisfactory in [modern] China but that of the new tranquilizers, sleeping pills, etc., is less so. Before 1973, the institute had not treated any case of abuse of these drugs; in 1982 they constituted 2.6 percent of its hospitalized patients. This paper reports the treatment and follow-up results of 22 such cases; 6 were addicted to one drug, 16 to several drugs. Duration of hospitalization averaged 85 days while outpatient treatment required an average of 2.5 years. Symptoms included those of withdrawal and those of chronic poisoning. Finding the withdrawal reaction unbearable, three of the group abandoned the treatment. Follow-ups of 14 cases for an average of 5.3 years found the treatment to remain effective for 12 cases. The symptoms and treatment procedures are described in some detail. For the purpose of preventing addiction, the paper cautions against administering several similar drugs at one time, higher than normal dosage, or regular doses for a prolonged period of time, as all these practices may lead to addiction.

This paper was received for publication in April 1983.

6248

CSO: 4009/18

SERUM SPECIFIC DNA POLYMERASE IN HEPATITIS B

Beijing BEIJING YIXUEYUAN XUEBAO [JOURNAL OF BEIJING MEDICAL COLLEGE] in Chinese Vol 16 No 2, 18 May 84 pp 110-112, 114

[Article by Wu Jingxin [0702 2533 2450] et al. of Department of Internal Medicine, People's Hospital, Beijing Medical College: "Determination and Clinical Significance of Serum Specificity DNA Polymerase Activity on 112 Cases of Hepatitis B"]

[Summary] A group of 66 males and 46 females of more than 1 year of positive serum HBsAg was used as the subject of this study; 45 healthy blood donors served as the control. Compared with the control, the HBV specific DNA-P activity of 40 cases of asymptomatic carriers in the group of positive HBsAg was found to be higher to demonstrate continuous replication and infectivity. It was found to be still higher in the remaining cases of positive HBsAg with simultaneously positive HBaAg, indicating even greater infectivity. The rise of DNA-P activity was not found to have a direct or parallel relationship with the increase of SGPT, neither was it found to be influenced by HBeAg and anti-HBeAg; however, instead, it was found to be related to the chronic condition of hepatitis B, resulting from a prolonged and persistent infection of the disease. Since the determination of DNA-P activity is more specific and reliable than that of HBeAg and since the former is presently the accepted index for judging the effectiveness of treatment and the degree of recovery of hepatitis B, here as well as abroad, its extensive clinical application in China is recommended by the paper.

6248

CSO: 5400/4101

LIFE SCIENCES

BRIEFS

DISCOVERY OF N-RAS CANCER GENE--Assistant researcher Gu Jianren [7357 0256 0086] and others at the Shanghai Municipal Oncology Research Institute have discovered for the first time the N-RAS cancer gene in human primary liver cancer. This research achievement passed appraisal this afternoon in Shanghai. At present, research on human cancer genes is an important topic of study internationally. Experts believe that this discovery by Gu Jianren has provided a requirement for future thorough research on molecular mechanisms of carcinomatous degeneration. [Text] [Beijing RENMIN RIBAO in Chinese 10 Nov 84 p 3]

CSO: 4008/143

Ballistics

AUTHOR : Liu Dun [0491 6868]

ORG : Institute of Natural Science History, Chinese Academy of Sciences

TITLE : "Graphic Ballistics - Introduction to 'Principles of Firearm'"

SOURCE : Beijing LIXUE YU SHIJIAN [MECHANICS AND PRACTICE] in Chinese No 3, 1984, pp 60-63

ABSTRACT : Li Shanlan [2621 0810 5695] (1811-1882) was a famous Chinese mathematician who systematically introduced mechanics from the west into China. He wrote "Principles of Firearm" in 1859, which turned out to be the first ballistics book in China. In this paper, his background and some contents of the book were reviewed and his achievement and impact were also assessed. The graphic method presented in the book was highly regarded as an original idea created by Li Shanlan. The book was considered to be well written in a simple, clear and logical manner and could be used as an artillery operating manual as well as a rigorous scientific book. It also provides an overview on the introduction and digestion of modern mechanics from the Western world.

12553

CSO: 4009/128

Biochemistry

AUTHOR: Yue Shuyun /2867 2885 7189/
Jiang Shouping /3068 1108 1627/

ORG: Shanghai Institute of Biochemistry, Chinese Academy of Sciences

TITLE: "Prediction of Maximum Base Pairing Folding Structure in Single Stranded RNA (DNA)

SOURCE: Beijing KEXUE TONGBAO [SCIENCE BULLETIN] in Chinese No 5, 1984
pp 302-305

ABSTRACT: The natural RNA is a single stranded molecule which is capable of folding into a partial double spiral structure by forming matching base pairs (primarily Adenosin and Uridine as well as Guanosine and Cytidine) through hydrogen bonding. The unpaired bases form local puckers. Thus a single stranded RNA molecule can form higher structures with alternating spirals and puckers. However, the most probable folding structure is of interest biologically. It is obviously determined by the free formation energy G of this stable structure. A mathematical graph theory treatment was introduced to treat this nucleic acid secondary structure problem as the maximum matching on a topological plain. An iterative, dynamic and rapid prediction method was established. With the aid of a computer, the maximum base pairing structure of RNA could be predicted. In order to demonstrate the prediction capability, several types of RNA molecules were processed on a TRS-80 microcomputer to obtain their maximum base pairing secondary structures. Results showed that this method was undoubtedly beneficial. However, it is still not perfect.

12553

CSO: 4009/8

Biochemistry

AUTHOR : Wu Guanyun [0702 0385 5366]
Zhang Junwu [1728 0193 2076]
Wang Shenwu [3769 3947 0063]
Xu Xiaoshi [1776 2556 4258]

ORG: Molecular Biology and Biochemistry Research Office, Institute
of Basic Medical Sciences, Beijing

TITLE: "Application of Cloned Plasmid-pRB α 1 for Detection of Human
 α -globin Gene"

SOURCE: Beijing ZHONGGUO YIXUE KEXUEYUAN XUEBAO [ACTA ACADEMIAE SINICAE]
in Chinese Vol 5 No 5, Oct 83 pp 275-279

ABSTRACT: An alpha-globin gene probe was prepared by using the genomic reconstructed plasmid, pRB α 1. Plotted with restriction endonuclease, the gene map of the plasmid revealed a 1.5 kb segment, Pst, which contained a whole α -globin. Following isolation and purification, the Pst I segment was labeled with ^{32}P by nick translation to complete the process of making it an alpha-globin gene probe. This probe was used for restriction endonuclease mapping of normal alpha-globin genes and for studying the gene organization of a victim of α -Mediterranean anemia. Results of these studies and those reported in related literature using an α -cDNA probe were found to be identical.

This paper was received for publication on 28 September 1982.

6248
CSO: 4009/1

AUTHOR: ZHANG Guoxiong [1728 0948 7160]
WANG Sufang [3769 4790 5364]
WANG Houji [3076 0624 1015]

ORG: All of the Shanghai Institute of Metallurgy, Chinese Academy of Sciences

TITLE: "Potentiometric Titration of Niobium Using a Tetraphenylphosphonium Ion-Selective Electrode"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 8,
20 Aug 84 pp 665-668

TEXT OF ENGLISH ABSTRACT: A new potentiometric titration method with tetraphenylphosphonium bromide as the titrant using a tetraphenylphosphonium indicator electrode for the determination of niobium is presented. The tetraphenylphosphonium electrode based on a PVC matrix containing a tetraphenylphosphonium perchlorate ion sensor plus mediator solvent exhibits a near Nernstian response with a slope of 58 mV/decade in the concentration range of $5 \times 10^{-8} \text{M}$. The coefficient of variation is 0.26 percent for 5-10 mg niobium. H_3PO_4 , HCl , tartaric acid, ammonium oxalate as well as Fe, Co, Ni, Al, Cu, Ti, Sn and Ge in large amounts do not interfere, while HClO_4 and HNO_3 must be avoided. The method has been found to be very useful for the determination of niobium in magnetic steels and superconductive materials.

AUTHOR: LI Junan [7812 2147]
ZHAO Zaofan [6392 5679 5672]

ORG: Both of the Department of Chemistry, Wuhan University

TITLE: "Polarographic Adsorptive Wave of Scandium-Alizarin S Complex"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 8,
20 Aug 84 pp 669-671

TEXT OF ENGLISH ABSTRACT: In a buffer solution of 0.02M potassium biphthalate at pH 4 containing glycine and tiron, by using single sweep oscillopolarography there occurs a sensitive derivative polarographic adsorptive wave for Sc-alizarin S complex. It can be used to determine trace amounts of Sc over a range of 2×10^{-7} - 4×10^{-6} M. The detection limit is 1×10^{-7} M. The method has been applied to determine trace amounts of Sc in minerals. The polarographic wave is probably caused by adsorption of Sc-alizarin S complex at DME, followed by reduction of alizarin S bound in the complex.

AUTHOR: YAO Xiuren [1202 0208 0088]
ZHOU Jixing [0719 4949 5281]
LI Chunfang [2621 2504 5364]

ORG: All of the Chinese Academy of Geological Sciences

TITLE: "A Study of Polarographic Adsorption Catalytic Wave of Scandium, Uranium, Thorium, Zirconium and Rare Earths. IV. Polarographic Catalytic Wave of Thorium and Determination of Trace Amounts of Thorium in Ores"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 8,
20 Aug 84 pp 671-674

TEXT OF ENGLISH ABSTRACT: A description is given of a sensitive catalytic wave of thorium in a solution of 0.005 percent cupferron - 0.02 percent diphenylguanidine - 0.02 percent ammonium oxalate - 0.05M ammonium chloride. The peak potential of the catalytic wave of thorium is at -1.47 V on oscillopolarograph Model JP-1A. The linear relationship occurs between the peak heights and with thorium concentration over the range of 0.5-40 ng/ml. The interfering ions are separated from Th with coprecipitation and extraction. This method has been applied to determine trace amounts of thorium in ores, and has met with satisfactory results.

AUTHOR: YU Weihua [0205 5633 5478]
YIN Xingjuan [1438 2622 1227]
WANG Houji [3076 0624 1015]

ORG: All of the Shanghai Institute of Metallurgy, Chinese Academy of Sciences

TITLE: "Kinetic Potentiometric Determination of Nanogram Amounts of Gallium with a New Lumogallion Selective Electrode"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 8, 20 Aug 84 pp 700-702

TEXT OF ENGLISH ABSTRACT: Lumogallion, a monoazo dye, can chelate with metals at different rates. A PVC-matrix lumogallion selective electrode was prepared in this laboratory. In this paper, the kinetics of the gallium reaction with lumogallion are studied with this electrode to monitor the course of the reaction. The effect of acidity and temperature on the reaction rate and the interference from foreign ions were tested. Ga of 5 ng to 100 ng was measured with good results at pH 5.

AUTHOR: XU Yongyuan [1776 3057 3293]
QIU Suntai [6726 1327 3141]

ORG: Both of the Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "Studies on Laser-Liquid Fluorimetry. I. Determination of Terbium, Dysprosium and Samarium"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 8,
20 Aug 84 pp 703-707

TEXT OF ENGLISH ABSTRACT: The optimum conditions for determining terbium, dysprosium and samarium simultaneously using Tiron as the fluorescence-complexing reagent are investigated. A certain amount of ethanol is added to the system so that the fluorescence intensities of those rare earth elements and their stabilities are increased. A laser-excited liquid fluorescence method is developed to determine terbium, dysprosium and samarium by using a UA-3 laser uranium analyzer in conjunction with special filters. The detection limits (ppt) are 0.04 for Tb, 0.4 for Dy and 0.9 for Sm. The sensitivity is over 100 times higher than that of the conventional liquid fluorimetry.

The contents of terbium, dysprosium and samarium in La_2O_3 , Gd_2O_3 , mixtures of rare earth oxides, geological standard samples and a rare earth mineral are directly determined without separation. The relative standard deviation is less than 10 percent in general for the determination of ppm or sub-ppm contents.

Chemistry

AUTHOR: LI Buhai [2621 2975 3189]
TIAN Shizhong [3944 0013 1813]
LI Yuwu [2621 3768 2976]
CHENG Jieke [4453 0094 0344]

ORG: All of the Laboratory of Analytical Chemistry, Wuhan University

TITLE: "Cation-Exchange Separation of Thorium (Zirconium), Scandium (Uranium) and Yttrium-Lanthanum with Arsenazo M as Eluant"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 8,
20 Aug 84 pp 710-713

TEXT OF ENGLISH ABSTRACT: Arsenazo M has been developed for an eluant agent. The eluate may be used for the direct spectrophotometric determination of U(VI), Th, Zr, Sc, Y and Ln. The ion-exchange equilibrium of U(VI), Th, Zr, Y, La, Gd and Lu has been investigated on macroreticular resin, a sulfonate of polystyrene divinylbenzene in arsenazo M solution. The adsorption coefficients were measured. The effects of various media (aqueous, acetic acid-sodium acetate and hydrochloric acid-sodium acetate buffer solution) and the mechanism of the effect of the medium have also been studied. The simple and rapid method for cation-exchange separation and direct spectrophotometric determination of Zr/Sc/Y-Ln, Zr/U(VI)/Y-Ln, Th/Sc/Y-Ln and 2 μg of RF/4 mg of U or Th mixtures has been proposed, and applied to the analysis of ore samples with satisfactory results.

AUTHOR: XIAO Yumin [5135 5940 3046]

ORG: Beijing Mining and Metallurgical Research Institute

TITLE: "Determination of Silver in Galena by Laser Micro-Spectrum Analyzer"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 8,
20 Aug 84 pp 718-720

TEXT OF ENGLISH ABSTRACT: This paper describes a method for determination of silver by using lead, a major element in galena, as an internal standard. The influence of laser sampling, lead content in galena, auxiliary spark discharge voltage and electrode point gap on analytical results is examined. The relative error is within 15 percent, and relative standard deviation is 6.6 percent.

Chemistry

AUTHOR: WANG Changwen [3769 2490 4773]
ZHANG Guiying [1728 2710 5391]

ORG: Guangzhou Institute of Chemistry, Chinese Academy of Sciences

TITLE: "Anodic Stripping Voltammetric Determination of Arsenic with Gold Film Electrode"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 8,
20 Aug 84 pp 778-779

TEXT OF ENGLISH ABSTRACT: A comparison is made of the stripping peak and reproducibility for arsenic in the medium of sulfuric acid, hydrochloric acid, nitric acid and perchloric acid or ammonium chloride, and 1N hydrochloric acid and 0.5N ammonium chloride at pH 3 to 4 are preferred. The determination of arsenic in rice and environmental samples has been carried out in 1N HCl with a detection limit of 0.1 ng/ml.

9717

CSO: 4009/60

AUTHOR: WAN Qun [8001 5028]
LI Yuzhen [2621 3768 3791]
XU Baokun [1776 1405 3824]
ZHAO Muyu [6392 1970 1946]

ORG: WAN and LI both of the General Research Institute of Non-ferrous Metals, Ministry of Metallurgical Industry; XU and ZHAO both of Jilin University, Changchun

TITLE: "A Study of the Carbide and Its Origin in Polycrystalline Silicon"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 4, 1984 pp 360-367

TEXT OF ENGLISH ABSTRACT: The carbide phase in polycrystalline silicon has been studied by means of electron probing. All polycrystalline silicon samples, regardless of their methods of preparation, are found to contain SiC particles. In the polycrystalline silicon bar, these particles are distributed at random. Their maximum size is about 70 μm and their maximum face density approaches $10^3/\text{cm}^2$. The results of element analysis show that their composition coincides with the stoichiometric ratio of SiC. The causes of SiC contamination and possible ways to reduce it in the preparation of polycrystalline silicon are discussed theoretically.

Engineering

AUTHOR: ZHENG Yiyang [6774 0001 7122]
ZHANG Jinchang [1728 6651 2490]

ORG: Both of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Super-Wide-Band Negative Resistance of Stationary Domain
Originated from the Cathode Deep Recess Doping Distribution in GaAs
Transferred Electron Devices"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 4, 1984 pp 380-387

TEXT OF ENGLISH ABSTRACT: Super-wide-band negative resistance of stationary domain originating from the cathode deep recess doping distribution in GaAs transferred electron devices is discussed. In this model, field distribution in the high-field domain is not the general triangle domain, but a flat field distribution in the active region. By small-signal analysis, it has been found that this model has super-wide-band negative resistance, thus making it possible to make super-wide-band negative resistance devices.

AUTHOR: ZHOU Dian [0719 7193]
TANG Pushan [0781 3877 1472]

ORG: Both of the Department of Electronics Engineering, Fudan University

TITLE: "An Analytic Algorithm for Two-Dimensional Placement of LSI"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 4, 1984 pp 396-403

TEXT OF ENGLISH ABSTRACT: An algorithm dealing with the placement problem of the gate-array chip is given. The algorithm applies an analytic method to the problem of quadratic assignment which is usually treated as a combinatorial problem. The optimum relative placement method, linear-assignment or fast space determination is used in the algorithm to find a near-best solution. The calculated results show that approximately the same minimized solution which is independent of initial placement can be obtained by the algorithm at about the same time interval.

The complexity of the algorithm (using fast space determination) is proportional to the order of n , i.e., $O(n)$. It is generally very fast. For problems containing about 100 to 200 cells, the calculating speed is about 10 times faster than that of forced directed placement. Also, the algorithm is quite suitable for a large-scale automatic design system.

AUTHOR: SHA Lu [3097 6424/15335]
TANG Pushan [0781 3877 1472]

ORG: Both of the Department of Electronics Engineering, Fudan University

TITLE: "An Approach to Polycell Placement for LSI"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 4, 1984 pp 412-421

TEXT OF ENGLISH ABSTRACT: A placement technique devoted to polycell layout of LSI and involving two steps is given: partitioning a circuit into blocks and placing the cells in them. The main algorithms used are: approximation method for assignment problem, Kernighan-Lin's method and branch-bound method. Improvements for these algorithms are proposed: 1. For solving assignment three selective functions are defined, among which F_2 is with prediction; 2. The objective functions and the interchange form of Kernighan-Lin's method are tailored to meet the special requirements of geometric parameters in partitioning. In addition, the branch-bound method is used in the iterative process, thus making it possible to reduce the search time in many situations.

The schematic diagram is given. The program is written in Fortran-4 language and has been implemented on a PDP-11/34 computer.

Engineering

AUTHOR: CHENG Kexing [4453 0668 5887]
ZHUANG Wenjun [8369 2429 0689]

ORG: Both of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "An Automatic Algorithm for LSI Placement of Biside Cell"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 4, 1984 pp 422-430

TEXT OF ENGLISH ABSTRACT: The model of a biside cell with redundant tracks is used and an efficient automatic algorithm for LSI placement is presented. This algorithm applies a method based on the division of the terminals into two equal parts to obtain one-dimensional constructive placements and uses various approaches to improve the iteration of placement. The overall consideration of the track assignment of all vertical connections in the placement processing brings about improvements in the overall rationality of the layout. This algorithm and that of track loss-profit analysis for channel routing are expected to be the base of an efficient layout system.

Engineering

AUTHOR: MA Xinrong [7456 9515 2837]
LI Zhijian [2621 1807 1017]

ORG: Both of the Institute of Microelectronics, Qinghua University

TITLE: "On the 'Kink' in $C(V)$ Curves of Deep Depleted MOS Structures"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 4, 1984 pp 440-442

TEXT OF ENGLISH ABSTRACT: Distinct kinks are observed in the $C(V)$ and $I(V)$ curves of a deep depleted type silicon MOS structure implanted with boron in the area around the gate electrode. This originates from the tunneling injection of valence electrons from the P^+ surface region near the gate electrode into the depleted channel. Experimental evidence is presented.

AUTHOR: TAN Changhua [6223 7022 5478]
XU Mingzhen [6079 6900 4176]

ORG: Both of the Department of Computer Science and Technology, Beijing University

TITLE: "Determination of Minority Carrier Bulk Generation Lifetime and Surface Generation Velocity by MOS Constant Charge Method"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 4, 1984 pp 443-448

TEXT OF ENGLISH ABSTRACT: It has been shown that, if the total charge of an MOS structure is constant in the process of transformation from non-equilibrium deep depletion to equilibrium inversion state, the generation lifetime and surface generation velocity can be determined simultaneously through a linear evolute of the relationship between the surface potential, ψ_s , of the semiconductor and the differentiation, dV/dt , of gate voltage with respect to time. An experimental set-up can show the ψ_s - dV/dt curves directly. Zerbst's overly elaborate graphical procedure is avoided.

Engineering

AUTHOR: ZHANG Xiumiao [1728 4423 8693]
GU Feng [7357 1496]
XIE Kexun [6200 0668 8113]

ORG: All of the Department of Physics, Hangzhou University

TITLE: "Effect of Gamma Irradiation on Al-SiO₂-Si/n System and Its Annealing Characteristics"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 4, 1984 pp 449-452

TEXT OF ENGLISH ABSTRACT: Co has been used as the source of γ -irradiation to study the interface radiation effect of the MOS system. The relationships between irradiation doses and the increases in effective positive charges and interface states induced by radiation for Al-SiO₂-Si/n systems at doses from 7.6×10^3 to 6.9×10^4 roentgen have been obtained experimentally. The annealing characteristics of the irradiation effect have also been studied. In addition, the experimental results have been analyzed and discussed.

9717
CSO: 4009/50

Epidemiology

AUTHOR: Dong Shengzhang [5576 0524 3864]
Huang Fangjing [7806 2455 4842]
Zhang Mengben [4545 1322 2609]
Zhou Qine [0719 3830 1230]
Jiang Hong [5592 5725]
Cai Aijiao [5591 1947 1207]
Zhang Bangyuan [1728 6721 6678]

ORG: Dong, Huang, Zhang of Wuhan Medical College; Zhou Jiang, Cai of Wuhan High Voltage Research Institute; Zhang of Wuhan Bureau of Electrical Power Supply

TITLE: "A Study on the Effect of Electric Field Induced by Ultrahigh Voltage Alternative Current on Human Beings and Animals"

SOURCE: Tianjin ZHONGHUA LAODONG WEISHENG ZHIYEBING ZAZHI [CHINESE JOURNAL OF INDUSTRIAL HYGIENE AND OCCUPATIONAL DISEASES] in Chinese Vol 2 No 3, 25 Feb 84 pp 152-154

ABSTRACT: The first part of the study involves the observation of blood, bone marrow, biochemical indices, reproductive capacity, etc., of 3 groups of 40 rats each, following contact with electric fields of 40 kv/m, 50 kv/m, or 100 kv/m for 60 days in durations of 2 hours each day. Aside from obvious drop of the rate of weight gain of the 100 kv/m group, the other indices were not found to be different from the control. The second part of the study involves 267 workers of ultrahigh voltage laboratories or 220 kv power transmission plants. Nervous, cardiovascular, blood, and biochemical indices were compared with those of the control; the electric and magnetic fields and the induction currents of the job sites were measured also. Aside from a 23.6-percent positive rate of neurasthenia among the workers, as compared with the 3 percent positive rate among the control group, no other differences were detected. The subject of the effects of electric fields has been frequently debated in China as well as the United States, the USSR, etc., since 1972. Based upon the results of this study, the paper concludes that working under a 220 kv high voltage power line should be considered as relatively safe.

6248

CSO: 4009/12

Hydrodynamics

AUTHOR : Lin Bingnan [2651 4426 0589]

ORG : Institute of Water Resources and Hydroelectric Power, Qinghua University

TITLE : "Some Applications of Fluid Dynamics in Water Projects in China"

SOURCE : Beijing LIXUE YU SHIJIAN [MECHANICS AND PRACTICE] in Chinese
No 3, 1984, pp 2-7

ABSTRACT : In this paper, some fluid dynamic problems associated with high dam construction and flood control in China are reviewed. In the area of dam construction, the aerated flow problem was first studied experimentally in 1957 at the Institute of Water Conservation and Hydroelectricity. Aeration was found to be beneficial to the prevention of damage caused by a high velocity water flow. Other problems such as cavitation, erosion and random vibration were also investigated. In flood control, problems such as reservoir hydrodynamics, river mouth flow and high sand content water flow were also addressed by modeling or experimentation. The scope of this review is limited. Some important work in the application of fluid dynamics to water conservation projects, such as the finite element method, flow excited vibration and water hammer analysis, was not discussed. The original manuscript, written in English, was presented at the Second Asian Fluid Dynamics Conference.

12553

CSO: 4009/128

AUTHOR: ZHENG Xinyu [6774 1800 3974]
LI Zhijian [2621 1807 1017]

ORG: Both of the Institute of Microelectronics, Qinghua University

TITLE: "Pulse $Q(V)$ Method Assisted by Pulsed and Steady Infrared Illumination for Si/SiO₂ Interface States Study"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 5, 1984 pp 457-467

TEXT OF ENGLISH ABSTRACT: A new method for the study of Si/SiO₂ interface states--the pulse $Q(V)$ method assisted by pulsed and/or steady infrared illumination--is proposed. The leading features of this method are high precision of measurement, ability of sample leakage current compensation and assurance of reliable equilibrium available for specimens even of long life-times or at low temperatures. A theoretical model suitable for both thermal and photo-thermal equilibrium conditions and an appropriate data processing method are given to ensure the fairly reliable determination of interface states distribution ranging over almost the whole silicon forbidden band with a single sample of N or P type.

AUTHOR: CHEN Kaimao [7115 7030 5403]
WANG Zhongan [3769 1813 1344]
FENG Chuguang [7458 0443 0342]
et al.

ORG: CHEN and WANG both of the Department of Physics, Beijing University;
FENG, et al. all of the Beijing Fifth Manufactory of Semiconductor Devices

TITLE: "Carrier Capture Properties of the Interface States at Si-SiO₂
Interface and the Energy Distribution of the Densities of Interface States"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese
No 5, 1984 pp 468-477

TEXT OF ENGLISH ABSTRACT: A new method for measuring the capture cross sections of interface states is suggested by using the transient capacitance technique, and this method has been used to measure the electron capture rates and cross sections of the interface states at the n-type Si-SiO₂ interface. The results show that the electron capture cross section strongly depends on the energy, i.e., σ_n almost exponentially decreases with energy toward the edge of the conduction band except for the interval of 0.53 to 0.38 eV from the conduction band. A method for interpreting the DLTS emission spectra of the carriers trapped at interface states into the energy distribution of the densities of interface states is also suggested in the case that the capture cross section depends on the energy, and this method has been used to analyze the results of the interface states at n-type Si-SiO₂ interface annealed by atomic hydrogen and molecular hydrogen.

AUTHOR: ZHU Bangfen [2612 6721 5358]

ORG: Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Effect of Non-Bonding Interaction Between Hydrogen Atoms on Vibrational Spectra of a-Si:H"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 5, 1984 pp 484-491

TEXT OF ENGLISH ABSTRACT: The non-bonding interaction between H-atoms, although small compared with the bonding interaction, is not negligible for a-Si:H, with H-content more than 5 at. percent. On this assumption the phonon density of states has been calculated by the Cluster-Bethe-lattice Method (CBLM). The clusters in use include hydrogen-saturated silicon vacancy (HSV), broken-bond model (BB) and HSV with certain dangling bonds. The results show that the non-bonding interaction between H-atoms leads to the appearance of the "quasi local mode" at 213 cm^{-1} observed by Shen, et al., and to the shift and broadening of the local mode (i.e., stretching mode at 2000 cm^{-1} and wagging mode at 630 cm^{-1}). A similar effect has also been obtained in the phonon density of states of a-Si:F, a-Si:D and a-Ge:H calculated by the same method.

Physics

AUTHOR: LIN Zhaohui [2651 2507 3518]
ZHANG Lizhu [1728 7787 3796]
REN Hong [0117 1347]
CUI Yucheng [1508 3768 2052]
et al.

ORG: LIN, ZHANG, REN, et al., all of the Department of Physics, Beijing University; CUI of the General Research Institute of Non-ferrous Metals

TITLE: "Study of 1.36 eV Photoluminescence Peak in Sn-Doped InP"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 5, 1984 pp 492-497

TEXT OF ENGLISH ABSTRACT: The influences of thermal annealing on photoluminescence of LEC-grown InP have been studied. As the annealing temperature of Sn-doped InP exceeds 500°C, a photoluminescence peak located at 1.36 eV appears. With the same thermal annealing conditions, this peak does not appear in undoped and S-doped InP samples. The study shows that in all probability the photoluminescence center corresponding to the 1.36 eV peak is the complex composed of the Sn and P vacancy.

AUTHOR: CHEN Kaimao [7115 7030 5403]
CHEN Kailai [7115 0418 0171]
WANG Zhongan [3769 1813 1344]

ORG: All of the Department of Physics, Beijing University

TITLE: "Dynamic Analysis of the $C-t$ Process in MIS Structure and a Method for Measuring the Spatial Distribution of the Generation Lifetimes of Minority Carriers in Semiconductors"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 5, 1984 pp 498-507

TEXT OF ENGLISH ABSTRACT: The $C-t$ process in pulse biased MIS structure is dynamically analyzed. The results show that the effect of interface states on the $C-t$ process is generally not negligible only in the depleting process of the interface and the inversion process of the semiconductor surface, and that the non-linearity of the Zerbst plot of the $C-t$ process mainly arises from the inhomogeneous spatial distribution of the generation lifetimes of the minority carriers in the semiconductor surface layer when the semiconductor surface is strong in inversion. A method for measuring this inhomogeneous spatial distribution is suggested for the first time by using the $C-t$ process in pulse biased MIS structures. An example is given for an n-type silicon MOS capacitor.

AUTHOR: HE Yuliang [0149 1342 0081]
YAN Yonghong [7346 3057 4767]
YIN Chenzhong [3009 2525 6988]
WANG Zhichao [3769 1807 6389]
SHEN Xuechu [3088 1331 4342]
ZHU Haorong [2612 3185 2837]

ORG: HE, YAN, YIN and WANG all of the Department of Physics, Nanjing University; SHEN and ZHU both of the Shanghai Institute of Technical Physics, Chinese Academy of Sciences

TITLE: "Hydrogen Content and Infrared Spectral Study of Hydrogenated Amorphous and Microcrystalline Silicon Films"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 5, 1984 pp 508-515

TEXT OF ENGLISH ABSTRACT: The experimental results for the hydrogen content, infrared vibrational absorption spectra and the annealing effects of hydrogenated amorphous and microcrystalline silicon grown with the GD method under different substrate temperatures, RF power and different growth rates are reported. The increase in substrate temperature and that of RF power both result in the decrease of the total content of hydrogen in the samples, so far as the relative concentration of SiH_2 and SiH groups are concerned, however, the increase of RF power seems to cause an increase of SiH_2 relative concentration, while the increase in substrate temperature leads to the decrease of SiH_2 relative concentration. It has also been shown with spectral measurement and annealing experiments that the thermal stability of the films is quite different for amorphous or microcrystalline samples grown under different conditions.

It is concluded that low growth rate seems to be helpful for thermal stability.

AUTHOR: KONG Meiyong [1313 2734 1758]
D.A. Andrews
G.J. Davies

ORG: KONG of the Institute of Semiconductors, Chinese Academy of Sciences; Andrews and Davies both of the British Telecommunications Research Laboratory

TITLE: "Electrochemical Selenium Doping of GaAs Grown by MBE"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 5, 1984 pp 523-528

TEXT OF ENGLISH ABSTRACT: The use of an electrochemical Knudsen cell as a molecular selenium source in the growth of n-type GaAs has been investigated. Net carrier concentration n between 10^{15} - 10^{18} cm^{-3} has been obtained. Hall mobilities of 6350-5300 $\text{cm}^2/\text{V}\cdot\text{s}$ at room temperature have been achieved for Se doped layers with $n=8.0 \times 10^{15}$ - 5.76×10^{16} cm^{-3} . The influence of growth conditions on Se doped GaAs is investigated and explained.

Physics

AUTHOR: ZHANG Taiping [1728 1132 1627]

ORG: Department of Computer Sciences and Technology, Beijing University

TITLE: "New Technology for Using Positive Photoresist--Low Temperature Development"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 5, 1984 pp 529-533

TEXT OF ENGLISH ABSTRACT: A new method--low temperature development (LTD)--without extra adhesive is reported. LTD increases the relative adhesion of positive photoresist. Patterns of 1-2 μm on SiO_2 and Si_2N_4 are made by this new technology. Some experimental conditions and results are suggested.

Physics

AUTHOR: LU Yongling [7627 3057 0109]
FU Chunyin [0265 2504 1377]

ORG: Both of the Department of Physics, Beijing University

TITLE: "Implantation of Rare Earth Element Yb into Silicon Single Crystals
by Pulse Laser Beam"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese
No 5, 1984 pp 540-543

TEXT OF ENGLISH ABSTRACT: Ytterbium, deposited on a silicon surface, has been incorporated into single crystals of silicon by a Q-switched Nd:YAG pulse laser with energy densities of $\geq 6\text{J/cm}^2$. The surface concentration of Yb in Si is $3 \times 10^{21}/\text{cm}^3$, while its concentration from the surface of Si to the depth of $0.75\text{ }\mu\text{m}$ is $7 \times 10^{19}/\text{cm}^3$. This has been determined by secondary ion mass spectrum analysis.

Physics

AUTHOR: HAN Hexiang [7281 0735 4161]
WANG Zhaoping [3076 0340 1627]
LI Guohua [2621 0948 5478]
et al.

ORG: All of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Raman Spectra of Oxygen Doped LPE GaAs"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese
No 5, 1984 pp 544-546

TEXT OF ENGLISH ABSTRACT: The Raman scattering spectra of oxygen doped LPE GaAs samples are reported. Coupled modes, L_+ and L_- , between plasmon and LO phonon of bulk lattice vibration and LO mode of surface depletion region were observed in the samples. In the range of electron concentrations from $2.7 \times 10^{17} \text{ cm}^{-3}$ to $5.6 \times 10^{18} \text{ cm}^{-3}$, the results observed experimentally are in good agreement with the theoretical calculation.

Physics

AUTHOR: LIN Yaowang [2651 5069 2598]
ZHANG Yanyun [1728 1750 0061]
LI Xiulan [2621 4423 5695]
LIN Lanying [2651 5695 5391]

ORG: All of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Epitaxial Growth of High Purity GaAs in an Argon Atmosphere"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese
No 5, 1984 pp 547-549

TEXT OF ENGLISH ABSTRACT: High purity VPE-GaAs was prepared with the AsCl₃ - Ga-Ar system. The epilayer with $\mu_{77K} = 2.05 \times 10^5 \text{ cm}^2/\text{V}\cdot\text{s}$ was obtained and the peak mobility was as high as $3.78 \times 10^5 \text{ cm}^2/\text{V}\cdot\text{s}$ at 35 K. For the sake of comparison GaAs was grown in an Ar system and also in an N₂ system with the same batch of start material. Hall measurements showed that the Ar system is more suitable for the preparation of high purity GaAs, especially for the growth of thinner epilayers. Photoluminescence measurements showed that the dominant residual acceptor impurity was carbon.

Physics

AUTHOR: CHEN Chunhua [7115 2504 5478]
WANG Chun [3769 4783]
ZHANG Libao [1728 4539 1405]
et al.

ORG: All of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Investigation of a Novel Integral Liquid Gallium Ion Source"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS]
in Chinese No 5, 1984 pp 550-553

TEXT OF ENGLISH ABSTRACT: The technique of making a novel integral liquid gallium ion source and the method of coating with gallium are described. The current vs voltage relationships under various temperatures are measured. The current changes slowly with time under a definite voltage. The influence of the geometry of the needle tip, i.e., the radius of curvature at its apex, on the I-V relationship is investigated by comparison of two typical needle tips. The experiments show that the construction of this source is simple, and therefore it can be easily made and mastered, and its lifetime can reach over 110 n.

Physics

AUTHOR: ZHU Bing [2612 0365]
BAO Ximao [7637 1585 5399]
LI Hesheng [2621 0735 3932]
et al.

ORG: ZHU, BAO and LI all of the Department of Physics, Nanjing University

TITLE: "Fabrication of Ohmic Contact on n-InP by CW-CO₂ Laser"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese
No 5, 1984 pp 554-557

TEXT OF ENGLISH ABSTRACT: A good Ohmic contact of AuGeNi/n-InP and Au/AuGeNi/n-InP has been prepared by CW-CO₂ laser irradiation instead of thermal alloying. The specific contact resistances achieved by laser irradiation can be compared with the best results obtained by thermal alloying. AES analysis shows that a good intermixing of various constituents has been obtained. A peak of Ge distribution near the interface is formed, which makes the contact excellent.

AUTHOR: MO Peigen [5459 1014 2704]
LI Shouchun [2621 1108 2504]
LI Yuexin [2621 6460 9515]
GAO Jijin [7559 7162 6855]
LI Shiling [2621 4258 1545]

ORG: MO and LI Shouchun both of the Shanghai Institute of Metallurgy, Chinese Academy of Sciences; LI Yuexin, GAO and LI Shiling all of the Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "Preliminary Study of the Doping of GaAs by Neutron Transmutation"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese No 5, 1984 pp 562-564

TEXT OF ENGLISH ABSTRACT: Undoped GaAs crystals have been irradiated with thermal neutrons to introduce shallow donors. The irradiation-induced damages can be removed effectively by thermal annealing. In this process the expected doping level ($\sim 5 \times 10^{17} \text{ cm}^{-3}$) can be obtained with the integral neutron flux $3 \times 10^{18} \text{ cm}^{-2}$ after annealing at 800°C in H_2 ambient for 2.5 h. The homogeneity of the doping of the wafers is determined by the electrochemical $C-V$ technique. The results show that the relative standard deviation of the doping concentration is lower than 5 percent.

AUTHOR: WANG Yunzhen [3769 0061 3791]
CHEN Xinhe [7115 1800 0735]
LI Yuezhen [2621 2588 3791]

ORG: WANG and CHEN both of East China Normal University; LI of the
Shanghai Institute of Metallurgy, Chinese Academy of Sciences

TITLE: "Analysis of the Composition of Oxygen-doped Polycrystalline
Silicon"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese
No 5, 1984 pp 569-572

TEXT OF ENGLISH ABSTRACT: The composition of oxygen-doped semi-insulating polycrystalline silicon films grown by the LPCVD method is analyzed by the infrared absorption spectra and statistical theory. These films consist of SiO , SiO_2 and an oxide intermediate between the two. The SiO_2 composition in SIPOS films increases as the oxygen concentration in the films increases.

AUTHOR: LIU Fengqi [0491 7364 1477]
NIU Wenzhi [3662 2429 1807]
LI Shaohai [2621 1421 3189]
LI Hao [2621 3185]

ORG: All of the Institute of Microelectronics, Shanxi

TITLE: "A Mask Fabricated Using Implantation of $^{31}\text{P}^+$ "

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese
No 5, 1984 pp 573-576

TEXT OF ENGLISH ABSTRACT: A method for fabricating LSI masks has been developed. An ion beam of $^{31}\text{P}^+$ with an iondose of 3×10^{15} ions/cm², kinetic energy > 120 keV, and a beam current from 35 to 50 μA was implanted into a thin layer of 4000 Å AZ-1350 spincoated on a glass plate printed with LSI patterns by conventional photolithography. The AZ-1350 resist hardens after the implantation, improving effectively the contrast between the implanted and unimplanted area, and the implanted area can mask UV light. In addition, the resistance of this implanted thin layer to mechanical abrasion and chemical etching is comparable to that of Cr or Cr₂O₃ films. It has, above all, the advantages of low reflection and simple fabricating process. Experimental results show that this kind of mask has a promising future.

9717

CSO: 4009/51

Radiation

AUTHOR: Mai Ziguang [7796 2535 1684]
Yang Qishan [2799 1477 1472]

ORG: The PLA Second Military Medical College

TITLE: "Application of Frozen Bone Marrow Cells in the Treatment of Radiation Injury"

SOURCE: Shanghai QUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese Mar 83 p 228

ABSTRACT: There have been many reports of successful treatment of such diseases as radiation injury, leukemia, aregenerative anemia, etc., with bone marrow hemapoietic cell transplant but obtaining and storing such cells remain to be a difficult problem. Seeking to make improvements over existing methods of freeze-storage, the authors designed a three-layered bottle, with the bone marrow specimen stored in a small amount of methanol in the innermost copper bottle. The middle bottle, made of plastic, is separated from the copper bottle by 40 percent glycerin. The outside bottle is a Dewar's flask [vacuum bottle], 1,500 mm in volume, filled with CO₂ dry ice and methanol. Stored in this manner, with the temperature quickly dropping to -78°C, the bone marrow was found to retain a cell count of 72 percent after 72 hours. Stored in Hanks fluid, only 40.5 percent of the cells would survive after the same duration.

6248

CSO: 4009/2

Radiation

AUTHOR: Huang Quanguang [7806 5425 0342]
Shi Jilan [0670 4764 5695]

ORG: Shandong Institute of Medicine

TITLE: "An Analysis of Human Chromosome Aberration in Cultured Lymphocytes of Uranium Miners"

SOURCE: Shanghai QUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese Mar 83
p 197

ABSTRACT: Peripheral blood lymphocyte specimens of 45 uranium miners and 69 healthy controls were analyzed. The male miners, aged 38-58, have worked in the uranium mines for 5-16 years. From the 6,373 metaphase cell specimens of the controls, 7 breakages and 2 fragments were discovered to produce a rate of spontaneous chromosomal aberration of 0.14/100 cells. From the 8,249 cells of the miners, the rate was 1.76 percent, 12 times higher than the controls. From 7,051 cells of a group of 65 neutron-gamma well logging workers, the incidence of chromosomal aberration was found to be 1.70 percent, not significantly different from that of the uranium miners of this study. A correlation between chromosome aberration and micronucleus, the latter being simpler to examine, is also briefly discussed in the paper.

6248
CSO: 4009/2

Radiation

AUTHOR: Zheng Siying [6774 2448 5391]
Zu Yonglie [2612 3057 3525]
Zhao Xiuying [6392 4423 5391]
Zhu Caiying [2612 6299 5391]
Dai Ying [2071 5391]
Shen Fu [3088 4395]

ORG: Zheng, Zu, Zhao, Zhu, and Dai of Suzhou Medical College; Shen of Shanghai Health and Quarantine Station

TITLE: "A Study on Chromosomal Aberrations in 18 X-ray Technician Interns"

SOURCE: Shanghai QUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 pp 195-196

ABSTRACT: Lymphocyte specimens were taken from a group of 18 young men before and after 6 months of internship as x-ray technicians in urban hospitals, where the condition of radiation protection is relatively satisfactory. During the internship period, the work load consisted of taking x-ray photos 50 patient-times per day per technician. Before the internship, chromosomal aberrations were observed in two of the group, within the common range of 0.3-0.5 percent. After the internship, they were discovered in 14 persons, with 4 of the group remaining free of them. It is not certain whether the individual difference was primarily due to a difference in the condition of radiation protection at different hospitals, or in the amount of attention given to the protective rules and devices by the individual, or in the individual variation of sensitivity to radiation exposure.

6248

CSO: 4009/2

Radiation

AUTHOR: Deng Zhicheng [6772 1807 6134]
Li Yunhua [2621 0061 5478]

ORG: North China Institute of Radiation Protection

TITLE: "Main Cause of Chromosome Aberration Increases in Blood Lymphocytes of Uranium Miners"

SOURCE: Shanghai GUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CU XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 pp 155-159

ABSTRACT: Surveys were conducted in 1974 and 1976 to clarify the gamma radiation exposure of various job sites and the rates of chromosome aberration among miners and hydraulic smelting workers of a certain uranium mine; the rates of both groups were found to be obviously higher than the control group of employees of the same mine. In view of the common belief that radon and its decay products are the chief culprit, surveys are carried out of miners of the Yunnan Tin Mine Company where gamma radiation is much lower and the density of radon and its decay products is singularly high. Results of these surveys demonstrate that prolonged absorption of high density radon does not have an obvious effect on the chromosome aberration rate, although experiments with direct induction of in vitro human and rat blood indicate otherwise. After absorption, attenuation must have occurred to make the radon less potent when it enters the blood stream. Gamma radiation should be, therefore, regarded as the chief cause of the increased rate of chromosome aberration among uranium miners.

6248
CSO: 4009/2

Radiation

AUTHOR: Li Zhirong [2621 1807 2837]

ORG: Shandong Institute of Medicine

TITLE: "Determination of Cellular Immunological Function in Uranium Miners"

SOURCE: Shanghai QUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 p 187

ABSTRACT: This study involved 48 male uranium miners, aged 38 to 50, having worked as uranium miners for 9 years on the average and having retired for 8 years. From peripheral blood, total Et-RFC, percentages of active Ea-RFC and B-RFC, ZYC, LTR and PHA were determined. A group of 40 males unrelated to radiation work formed the control. The cellular immunological function of the retired miners was found to be obviously lower. Domestic studies of recent years indicate that prolonged exposure to small dose radiation can suppress immunological function while the chief long-range danger to uranium miners from such exposures is the possibility of lung cancer; there have been no report of suppression of immunological function after 8 years of separation from uranium mining, however. Obvious increase of rate of chromosome aberration in lymphocytes of the studied retired miners was also observed.

6248

CSO: 4009/2

Radiation

AUTHOR: Huang Quanguang [7806 5425 0342]
Shi Jilan [0670 4764 5695]

ORG: Shandong Institute of Medicine

TITLE: "60Co Gamma Ray Induced Chromosomal Aberrations in Human Peripheral Blood Lymphocytes Irradiated in Vitro Dose Response Relations"

SOURCE: Shanghai QUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 p 194

ABSTRACT: Human whole blood specimens were irradiated in vitro with 60Co gamma ray in doses of 0, 5, 10, 22, 44, 88, 131, 175, 263, 350, and 438 rad, and cultured. From each dosage group, 400 metaphase cells were analyzed and resultant data computed to study the relationship between radiation dosage and chromosomal aberration response. Within the range of 25-70 rad, the RBE of induced aberrations was found not to be a constant. It increased slowly with the increase of dosage. Almost all forms of aberration were in morphology; monosomic [heterotypical] deviations were extremely rare. There was no definite relationship between dosage and the incidence of tricentric, ring, reciprocal translocation, or polyploidic aberrations; beginning at 44 rad, the frequency of dicentric chromosomes increased obviously with the increase of dosage.

6248

CSO: 4009/2

Radiation

AUTHOR: She Jilan [0670 4764 5695]
Huang Quanguang [7806 5425 0342]

ORG: Shandong Institute of Medicine

TITLE: "Dose-response Relations of Chromosomal Aberrations in Human Peripheral Blood Lymphocytes Irradiated in Vitro With 14MeV Neutrons"

SOURCE: Shanghai QUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 p 195

ABSTRACT: Following irradiation with 14MeV D-T neutrons and culture for 52-54 hours under standard in vitro conditions, all metaphase cells were observed and analyzed after the first mitosis. The experimental results indicate that under low dosage (2.1 - 70 rad) conditions, there remains a linear relationship between incidence of chromosomal aberrations and applied dosage. In other words, there does exist a theoretical premise for using chromosome aberration as a "biological dosimeter." The RBE of neutron induced centromeric aberrations is not a constant; however, it decreases with the increase of dosage ($r = 0.9331$, $p < 0.01$).

6248
CSO: 4009/2

Radiation

AUTHOR: Bai Yushu [4101 3768 2579]
Guan Shurong [7070 2885 2837]
Zhang Xiuxia [1728 4423 7209]

ORG: Laboratory of Industrial Hygiene, Ministry of Public Health

TITLE: "Relationship Between Radiation Dose and Chromosome Aberration Induced by ^{60}Co Gamma Radiation in Human Peripheral Blood Lymphocytes in Vitro"

SOURCE: Shanghai QUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 pp 193-194

ABSTRACT: For the experiment, blood of each of the 9 donors was divided into 8 portions, one for control and 7 for irradiation with 7 different doses of ^{60}Co gamma ray. Irradiated specimens were kept in constant temperature for 90 minutes before culture under 37°C for 46 hours to prepare slides for chromosome analysis. Models were established to compute the relationship between the rates of various forms of aberration and the absorption dosage. Results were compared with reports of other scientists on the subject. Details of the experimental results are not presented in the published paper.

6248

CSO: 4009/2

Radiation

AUTHOR: Liu Ji [0491 0644]
Fan Hongxue [5400 3163 1331]
Ju Guizhi [7263 2710 5347]
Du Wanfa [2659 8001 4099]
Liu Wenxiang [0491 2429 4382]

ORG: N. Bethune Medical College

TITLE: "Studies on the Role of Hemopoietic Microenvironment in the Recovery of Hemopoiesis From Radiation Injuries"

SOURCE: Shanghai GUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 pp 142-144

ABSTRACT: For the experiment, 1,678 white mice were irradiated with ^{60}Co and x-ray for histopathological, bone marrow cell count and classification, reticuloendothelial cell and fiber cell count, spleen cell count and other observations. The relationship between the extent of injury borne by the microcirculation and the bone marrow count, the effect of bone marrow mucopolysaccharide changes on hemopoietic mechanism during the acute stage of radiation injury, and the treatment effects of madder (a Chinese medicinal herb), anise camphor, and ethinyloestradiol, all microcirculation supportive drugs, were studied. Beneficial effects of all three drugs are confirmed with brief experimental data, without venturing into their comparison, however. The paper concludes that following radiation injury, measures for treating and protecting the hemopoietic microenvironment are of extreme importance and should never be neglected.

6248

CSO: 4009/2

Radiation

AUTHOR: Luo Meichu [5012 2734 0443]
Shen Binyuan [3088 1755 3293]
Yuan Tianming [7086 1131 2494]
Yu Zhichang [0205 1807 2490]

ORG: Shanghai Institute of Industrial Hygiene

TITLE: "Studies on Drugs for Blocking Absorption of Radiostrontium"

SOURCE: Shanghai QUANGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU
BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL
CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 pp 235-236

ABSTRACT: Rodens were administered ^{85}Sr in the experiment to study the absorption blocking effects of barium sulphate, sodium alginate, aluminum phosphate, and aluminum hydroxide. Aside from barium sulphate which was found to produce no effect, positive effects were observed in the remaining. The effective drugs in different forms were further compared, and aluminum hydroxide gel was found to be the best. With it, the portion of ^{85}Sr that was not absorbed was excreted in the feces and the portion that was accumulated in the roden body and its skeletal bones was found to be the lowest. It was also found to be equally effective when it was applied as a protective agent half an hour before administrating ^{85}Sr , instead of immediately afterwards. Sodium alginate demonstrated no such protective effect. Combinations of these blocking agents were found to add no absorption blocking power to that of each of the agents applied singularly.

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CSO: 4009/2

Radiation

AUTHOR: Zhu Weijing [2612 5588 4737]
Li Guoguang [2621 0948 0342]
Zhang Zongxian [1728 1350 7359]

ORG: Zhu, Li of Sichuan Industrial Hygiene Institute; Zhang of Sichuan Medical College

TITLE: "Effect of Heterogenous Bone Marrow Transplant and the Character of Histological Reaction in Acute Radiation Disease"

SOURCE: Shanghai GUANGGUO FUSHE YANJIU YU FUSHE GONGYI XUEHUI DIYI CI XUESHU BAOGAOHUI LUNWEN XUANBIAN [SELECTED PROCEEDINGS OF THE FIRST NATIONAL CONFERENCE ON RADIATION RESEARCH AND RADIATION PROCESSING] in Chinese
Mar 83 pp 228-229

ABSTRACT: This paper reports the results of treating 135 mice with the bone marrow of rats, after having been irradiated experimentally with lethal doses of x-ray. The survival rate of the mice was 50.72 percent in 22 days and 20.17 percent in 30 days after irradiation. After receiving the transplant, (1) if the heterogenous bone marrow cells continue to survive in the recipient after 20-108 days, the secondary disease (weight loss, diarrhea, fur standing on end, etc.) and death will occur although at this time the hemogram and the nucleated cells in the bone marrow are recovering; (2) If the transplant grows well early and the mice pass through the critical stage and recover, the transplant will disappear in 30 days and the secondary disease will not occur; (3) If the transplant does not grow, but the mice pass through the critical stage and recover, the secondary disease will not occur either. Histochemical observations indicate that sedimentation and propagation of the bone marrow transplant in the body of the recipient and the existence of lymphocytes in the transplant are possibly the important reason for the occurrence of the secondary disease, and the occurrence of the secondary disease is the chief cause of death after bone marrow transplant.

6248
CSO: 4009/2

Virology

AUTHOR : Yuan Li [7086 0500]
Ren Guifang [0117 6311 2455]
Yuan Weiqin [7086 5633 3830]
Zhu Chun [2612 5783]
Zhu Jiming [2612 2478 2494]

ORG : Institute of Virology, Beijing

TITLE : "Expression of HBsAg in Mammalian Cells by Cotransformation"

SOURCE : Beijing ZHONGGUO YIXUE KEXUEYUAN XUEBAO [ACTA ACADEMIAE SINICAE]
in Chinese Vol 5 No 5, Oct 83 pp 269-274

ABSTRACT : This paper reports the successful introduction of two plasmids containing a single copy of hepatitis B virus genome (ayw or adw) into mouse Ltk cells by calcium precipitation and cotransformation with thymidine kinase (tk) gene of cloned herpes simplex virus. Under selective pressure of HAT medium, six cloned tk+ cell lines were found to excrete specific HBsAg in cell culture medium and to contain HBsAg particles about 22nm in diameter, being similar to those shown in human serum. Subline-cells produced after 160 days of subcloning were found to retain the ability to excrete HBsAg. Results of this experiment appear to demonstrate that while dual copies of HBV-DNA in tandem are not essential, repeated cloning is the necessary procedure for selecting cell lines of stable HBsAg expression. The HBsAg yield is low, lower than that which reported by Dubois et al. The problem of increasing the yield is presently being studied by the authors. This paper was received for publication on 1 March 1983.

6248
CSO: 4009/1

END